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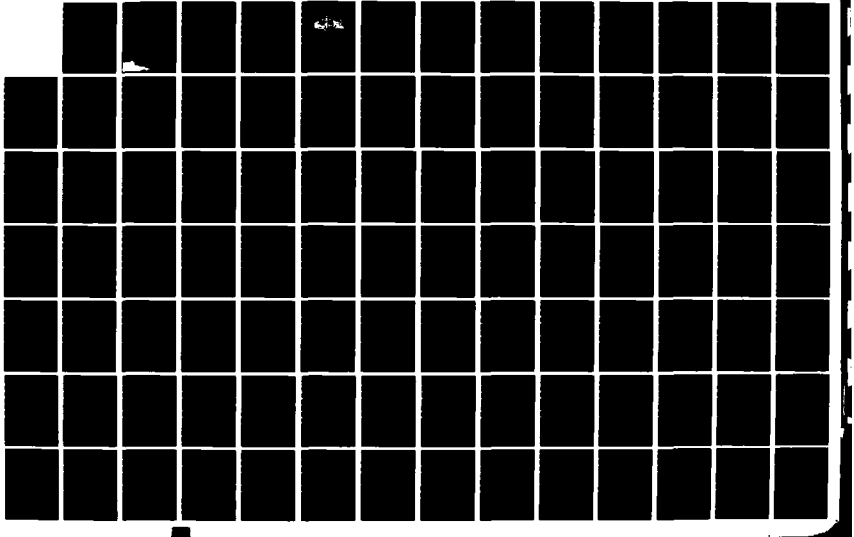

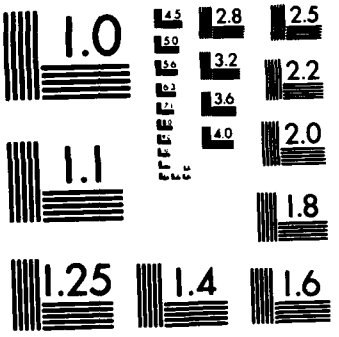

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

UNITED STATES AIR FORCE

SUMMER FACULTY RESEARCH PROGRAM

conducted by the

SOUTHEASTERN CENTER

FOR ELECTRICAL ENGINEERING EDUCATION

(SCEEE)

1984

MANAGEMENT REPORT

WARREN D. PEELE EARL L. STEELE

PROGRAM DIRECTORS, SCEEE

THE SCEEE PRESS

UNCLASSIFIED

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This program provides opportunities for research in the physical sciences, engineering life sciences, business, and administrative sciences. The program has been effective in providing basic research opportunities to the faculty of universities, colleges, and technical institutions throughout the United States. The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs.

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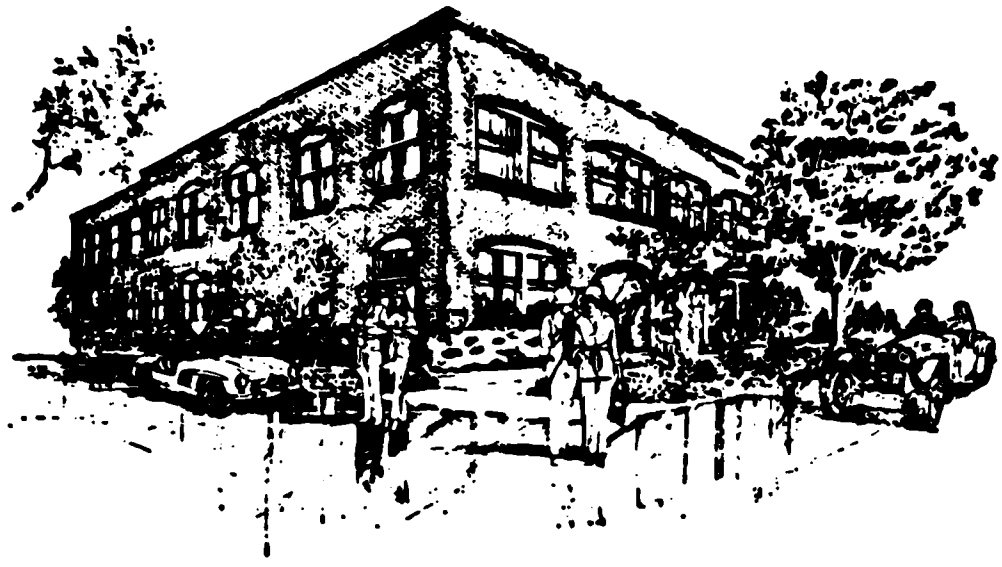

SCEEE

1984

UNITED STATES AIR FORCE

SUMMER FACULTY RESEARCH PROGRAM

1984

PROGRAM MANAGEMENT REPORT

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION

Program Directors, SCEEE
Warren D. Peele
Earl L. Steele

Program Manager, AFOSR
Major Amos L. Otis

Submitted to

Air Force Office of Scientific Research

Bolling Air Force Base

Washington, DC

December 1984

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I. INTRODUCTION AND HISTORY

The United States Air Force Summer Faculty Research Program (USAF-SFRP) contract was awarded to the Southeastern Center for Electrical Engineering Education on December 14, 1981. The contract is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force and is conducted by SCEEE.

The program provides opportunities for research in the physical sciences, engineering, life sciences, business, and administrative sciences. The program has been effective in providing basic research opportunities to the faculty of universities, colleges, and technical institutions throughout the United States.

The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs.

Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was highly successful and was expanded in 1983 to 53 students; there were 84 graduate students in the 1984 program.

Follow-on research opportunities have been developed for a large percentage of the participants in the Summer Faculty Research Program in 1979-1983 period through an AFOSR Minigrant Program.

On 1 September 1983, AFOSR replaced the Minigrant Program with a new Research Initiation Program to be administered by SCEEE. The Research Initiation Program provides follow-on research awards to home institutions of SFRP participants. Awards were made to approximately 50 researchers in 1983. The awards are for a maximum of $12,000 and a duration of one year or less. Substantial cost sharing by the schools contributes significantly to the value of the Research Initiation Program. In 1984 there will be approximately 80 Research Initiation awards.

II. RECRUITING AND SELECTION

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1984 program was conducted via direct mail to all accredited engineering departments and schools; and all departments of chemistry, physics, mathematics, and computer science. Information on the SFRP was mailed to over 500 department chairmen; brochures were made available to all participating USAF laboratories/centers; distribution was made through AFROTC units on university campuses; information was supplied to all who made requests. Overall, more than 7500 brochures were distributed throughout the country.

In 1979, 70 faculty members participated. In 1980 and 1981, 87 faculty members participated each year; 91 faculty and 17 students participated in

the 1982 program. In 1983, 101 faculty and 53 students participated. In the 1984 program there were 152 faculty members and 84 graduate students appointed to Air Force facilities. There were approximately three applicants for each available Summer Faculty Research position in 1984.

Applications were due at SCEEE on or before February 1, 1984. The selection panel convened in February and announcements of selections were made before March 1, 1984.

III. PRE-SUMMER VISIT (Optional)

After each research associate had signed and returned his appointment letter from the Southeastern Center, he was directed to contact the designated representative at the laboratory/center of assignment to discuss a pre-summer visit. The purpose of the pre-summer visit is basically threefold: 1) to meet laboratory personnel, especially the Effort Focal Point with whom the Research Associate would be working most closely, and to become personally acquainted with the laboratory facilities; 2) to finalize and formalize objectives for the Research Associate's summer research period and report these to SCEEE; 3) to make arrangements for lodging for the research period. The focus of this visit was on making sufficient preparations so that the ten week summer research effort would be effective.

IV. GRADUATE STUDENT SUMMER RESEARCH PROGRAM (GSSRP)

A pilot program for Graduate Student Summer Research via the AFOSR Summer Faculty Research Program (SFRP) was initiated by contract modification on 26 March 1982. The program was developed as an adjunct effort to the SFRP. Its purpose is to provide funds for selected graduate students to work at appropriate Air Force laboratories or centers with supervising professors who hold concurrent SFRP appointments. During the 1984 program, 84 graduate students representing 42 schools and 20 disciplines were appointed from 112 applicants.

The 1984 GSSRP report is published as three separate documents under the 1984 Summer Faculty Research Program and are entitled, Graduate Student Summer Research Program Management Report and Technical Reports, volume I and II, SCEEE Press, October 1984.

V. SITE VISITS

6 June 1984
Visit to: Rocket Propulsion Laboratory
Edwards Air Force Base, California

16 July 1984
Visit to: Frank J. Seiler Research Laboratory
United States Air Force Academy, Colorado

17 July 1984
Visit to: Human Resources Laboratory
Lowry Air Force Base, Colorado

SITE VISITS (continued):

18 July 1984
Visit to: Weapons Laboratory
Kirtland Air Force Base, New Mexico

20 July 1984
Visit to: Human Resources Laboratory
Occupational & Environmental Health Laboratory
USAF School of Aerospace Medicine
Brooks Air Force Base, Texas

21 July 1984
Visit to: Aerospace Medical Research Laboratory
Aero Propulsion Laboratory
Avionics Laboratory
Business Research Management Center
Flight Dynamics Laboratory
Human Resources Laboratory
Logistics Command Laboratory
Materials Laboratory
Wright-Patterson Air Force Base, Ohio

1 August 1984
Visit to: Geophysics Laboratory
Hanscom Air Force Base, Massachusetts

2 August 1984
Visit to: Rome Air Development Center
Griffiss Air Force Base, New York

9 August 1984
Visit to: Armament Division
Eglin Air Force Base, Florida

10 August 1984
Visit to: Engineering Services Center
Tyndall Air Force Base, Florida

Visits listed include those by SCEEE and AFOSR personnel. The participating faculty are generally satisfied with the mechanics of the program. All faculty, USAF research colleagues, and students applaud the Graduate Student Summer Research Program. Criticisms were: (a) advance pay is needed; (b) housing for researchers with families is hard to find; (c) better clerical support is needed on site; and (d) on-campus support for students is desirable.

We find that the objectives of the SFRP are being well served. SFRP Research Fellows indicate that they are performing independent research, and are not being used as "summer help". There are some misconceptions by research colleagues and research fellows concerning the purpose of the program; one misconception is that the program is suitable for repeated

research efforts by an individual. However, in this program we have found no abuse of the non-personal services requirements. As expected, enthusiasm is high for the possibilities of follow-on funding by AFOSR at the home university. Research fellows often conduct lectures and seminars at the Air Force locations.

As a record of the documentation supplied to the appointees, the SCEEE Information and Appointment Packets are provided in Appendix I of this report.

VI. VISITS TO HISTORICALLY BLACK COLLEGES (HBC)

As part of its Affirmative Action Program, SCEEE conducted several extended visits to HBC campuses during the 1983-1984 academic year in order to encourage the participation of HBC faculty in the Summer Faculty Program. Discussions were held with potential faculty participants and department chairmen.

During the 1983-84 academic year, extended visits were made to the following schools:

Atlanta State University, Atlanta, Georgia
Atlanta University Center, Atlanta, Georgia
Jackson State University, Jackson, Mississippi
Morehouse College, Atlanta, Georgia
Morris Brown College, Atlanta, Georgia
Prairie View A&M University, Prairie View, Texas
Southern University of Baton Rouge, Baton Rouge, Louisiana
Southern University of New Orleans, New Orleans, Louisiana
Texas Southern University, Houston, Texas
University of Puerto Rico, Mayaguez, Puerto Rico

VII. RESEARCH INITIATION PROGRAM

For several years prior to 1983, AFOSR conducted a special follow-on funding program for Summer Faculty Research Program (SFRP) participants; this was popularly known as the AFOSR Minigrant Program. That program was superceded in 1983 by the Research Initiation Program conducted by SCEEE. The Research Initiation Program is being conducted by SCEEE again and is extended into the 1984-85 academic year.

To compete for a Research Initiation Program award, SFRP participants must submit a complete proposal and proposed budget either during or promptly after their SFRP appointment periods.

Each proposal is evaluated for technical excellence, with special emphasis on relevance to continuation of the SFRP effort, as determined by the Air Force laboratory/center. The final selection of awards is the responsibility of AFOSR.

The most effective proposals are those which are closely coordinated with the SFRP Effort Focal Point and which follow the SFRP effort with proposed research having strong prospects for later sustained funding by

the Air Force laboratory/center.

The maximum award under the Research Initiation Program is $12,000 plus cost-sharing up to a matching total amount.

The mechanics of applying for a Research Initiation Program award are as follows:

(1) Research Initiation Program proposals of $12,000 plus cost-sharing were to be submitted after August 1, 1984 but no later than November 1, 1984.

(2) Proposals are evaluated and a final award decision is the responsibility of AFOSR after consultation with the Air Force laboratory/center.

(3) The total available funding limits the number of awards to approximately 75, or half the number of 1984 SFRP participants.

(4) Awards are negotiated with the employing institution, designating the individual as Principal Investigator, with the period of award having a start date no earlier than September 1, 1984 and a completion date no later than December 15, 1985.

Employing institutions are encouraged to cost-share since the program is designed as a research initiation procedure. Budgets must include, where applicable, Principal Investigator time, graduate assistant and support effort, equipment and expendable supplies, travel and per diem costs, conference fees, indirect costs, and computer charges.

In summary, a Research Initiation proposal must be:

(A) Technically excellent;
(B) A continuation of SFRP work;
(C) Received no later than November 1, 1984;
(D) Budgeted not to exceed $12,000 plus cost-sharing.

VIII. AIR FORCE WEAPONS LABORATORY RESEARCH SCHOLAR PROGRAM

In April 1983, the Air Force Office of Scientific Research, the Air Force Weapons Laboratory, and the Southeastern Center for Electrical Engineering Education initiated an Air Force Weapons Laboratory (AFWL) Research Scholar Program with appointments to begin in the fall, 1983. This program provided research opportunities for selected engineers and scientists holding a doctoral degree to work at the Air Force Weapons Laboratory for a one year research period. This program is an extension of the SFRP concept and will be reported in a separate document after the program is concluded.

To be eligible, all candidates must be U.S. Citizens and have a Ph.D. or equivalent in an appropriate technical field. The scholars were selected from such basic and applied science and engineering fields as

physics, particularly nuclear and laser physics, civil, electrical aeronautical, nuclear and mechanical engineering and also applied mathematics and computer science. Four appointments were made for the one year residencies.

The first appointments started in the fall 1983 and were for one year. The program objectives are:

(1) To provide a productive means for scientists and engineers holding Ph.D. degrees to participate in research at the Air Force Weapons Laboratory;

(2) To stimulate continuing professional association among the scholars and their professional peers in the Air Force;

(3) To further the research objectives of the United States Air Force; and

(4) To enhance the research productivity and capabilities of scientists and engineers especially as these relate to Air Force technical interests.

APPENDIX I

In this appendix we have collected the following documents which were distributed to appointees and other program participants.

A. Information Brochure for SCEEE Fellows.

B. Questionnaire for participants and a summary of their replies.

C. Questionnaire for the Air Force research colleague at the Air Force laboratory or center and a summary of their replies.

D. Questionnaire for Air Force laboratory representative and a summary of their responses.

APPENDIX 1.A

INFORMATION BROCHURE

for

SCEEE FELLOWS

on the

1984 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

March 1984

INFORMATION BROCHURE

for

SCEEE FELLOWS

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I. SCEEE FELLOW OBLIGATIONS

SCEEE is required by contract to impose certain obligations on you in your status as a SCEEE Fellow. This section outlines those obligations, and you should read them thoroughly. You are required to sign and return the statement of understanding before the final processing of your appointment can be completed. The following is a list of these obligations:

1. Pre-summer Visit: A pre-summer visit to your research location is optional. Approval for such a trip may be granted upon your written request to SCEEE along with the written concurrence of the Laboratory/Center representative. The purpose of this visit is to enable you to make your final plans for the summer research period if needed. Reimbursement is paid for allowable travel expenses incurred on a pre-summer trip as indicated in the Allowable Travel Expenses section (page 4) of this brochure. To be reimbursed, you must invoice for it as described in the Information for Invoicing for Compensation and Reimbursement section (page 5) of this brochure.

2. Research Goals and Objectives: A statement of research objectives must be provided to SCEEE PRIOR TO the start of the Summer Research period. It should outline your goals and the approach you intend to follow in researching these goals. Neither travel expenses nor expense allowances will be reimbursed until after receipt of your statement of research objectives. The report should also clearly indicate the date of your first working day of the summer research period.

3. Final Report: At the end of your summer research effort, you are required to submit to SCEEE a completed, typewritten scientific report stating the objectives of the research effort, the approach taken, results, and recommendations. Information on the required report format will be sent to you with a "FINAL REPORT INFORMATION BULLETIN" and sample report illustrating a suggested format. The final report must first be approved by your Effort Focal Point and then transmitted so as to reach SCEEE by Monday September 28, 1984. Payment of " Compensation" for the final two weeks of your ten-week research period cannot be made until SCEEE has received and approved this report in the required format.

4. Program Evaluation Questionnaire: You will be sent a critique form to complete near the end of your research period regarding your impressions of the program. This critique form should be completed and returned to SCEEE, along with your final report, by Monday, September 28, 1984. The return of this form is a program requirement; it also must be received by SCEEE before the final compensation payment can be made.

5. U.S. Air Force - SCEEE Fellow Relationship: The U.S. Air Force and SCEEE understand and agree that the services to be delivered by SCEEE Fellows under this contract will be non-personal services and the parties recognize and agree that no employer-employee or master-servant relationships will exist between the U.S. Air Force and the SCEEE Fellows. Non-personal services are defined as work performed by an individual who is responsible for an end item, such as a report, free of supervision of the U.S. Air Force and free of an employer-employee relationship.

As a SCEEE Fellow, you will not:

(a) Be placed in a position where you are appointed or employed by a federal offic or are under the supervision, direction, or ev..uation of a federal officer, military or civilian.

(b) Be placed in a staff or policy-making position.

(c) Be placed in a position of command, supervision, administration, or control over Air Force military or civilian personnel or personnel of other contractors or become a part of the U. S. Air Force organization.

The services to be performed under the SFRP do not require SCEEE or the SCEEE Fellow to exercise personal judgement and discretion on behalf of the U.S. Air Force; rather, the SCEEE Fellows will act and exercise personal judgement and discretion on their research programs on the SFRP conducted by SCEEE.

The Air Force will have unrestricted use of and access to all data developed during the period of this appointment.

II. ALLOWABLE TRAVEL EXPENSES

The SFRP provides potential funding for two trips between your home and your assigned research location. As soon as you have signed and returned your appointment letter along with the budget sheet, you will be authorized to receive reimbursement for travel expenses as described below.

As outlined in the SCEEE Fellow Obligations section in this brochure, you may make a pre-summer visit in addition to the trip to and from your assigned research location for your summer effort. You are expected to make your own arrangements for these trips, and after the trips you may invoice SCEEE for reimbursement of allowable expenses in the format described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure. Closely coordinate your travel plans with your EFFORT FOCAL POINT.

All travel reimbursements under SCEEE Fellow appointments are made according to current SCEEE policy, and deviations from the approved budget are not authorized and will not be reimbursed. In light of these restrictions, you may choose either to travel by common carrier at coach rates or less, by driving your private auto, or by a combination of both. (Please note that funding for rental cars requires ADVANCED WRITTEN approval by SCEEE and SCEEE will not reimburse this expense unless the prior written approval is obtained.) With any of these choices you may claim reimbursement up to the amount for the most direct routing, taking into the account the desirability of routing on interstate highways if you drive your private auto.

Reimbursement for direct route travel by common carrier will be paid on your submission of an invoice to SCEEE following the invoicing instructions referenced above. In the view of the convenience of having a car at the research location, SCEEE strongly recommends that a private auto be used for travel when practical. Reimbursement when you drive your private auto is at the rate of 20¢ per mile within the above routing restrictions and will be paid on submission of a suitably prepared invoice. These reimbursements cannot be extended to cover travel by your family if they accompany you on either of these authorized trips.

During the pre-summer visit, you will be authorized to claim a per diem reimbursement at the rate of $48.00 per day for a maximum of three days spent at your assigned research location. Instructions for claiming this per diem are also described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure.

During the ten-week summer research period, you will be authorized to receive an expense allowance in lieu of a per diem payment at a rate of $35 per day for a maximum of 70 days. To receive this allowance, you must invoice for it.

These items above are the only reimbursable travel allowances authorized under the SFRP appointment. Any additional travel expenses incurred during the appointment period will be your personal responsibility.

III. INSTRUCTIONS FOR INVOICING FOR COMPENSATION AND REIMBURSEMENT

Attached is a copy of the invoice format that you are required to use to obtain compensation or reimbursement from SCEEE. Note that all disbursements by SCEEE for compensation, travel, and/or other expenses are subject to audit approval, so you must submit receipts substantiating charges invoiced.

In addition, you must prepare, sign, date and attach to each completed invoice a Brief Report of Effort.

A. PREPARATION OF BRIEF REPORT OF EFFORT

Whenever you submit an invoice for reimbursement to SCEEE you must also include a brief report describing your activities for the invoice period. To meet this obligation, you must prepare, date, sign, and attach to your completed invoice a Brief Report of Effort describing the research accomplished on the appointment and explain any travel during the invoice period.

This report should describe innovative techniques and designs or discoveries which may be disclosed as patents. Rights to any inventions or discoveries shall reside with SCEEE unless determined otherwise by the contracting agency.

The brief report should never exceed one typewritten page and most often should be considerably shorter than one page.

The following is an example of such a report:

BRIEF REPORT OF EFFORT

Effort has been initiated on pole extraction methods. The modified ordinary least squares technique has been giving fair results. Work is presently being done on finding a better matrix inversion technique for the case when the coefficient matrix is ill-conditioned. Some problems have been encountered with conditioning when the data is filtered.

Travel invoice is for the trip to my research location.

_____ June 22, 1984

B. PREPARATION OF INVOICE FORMAT

Detailed instructions on properly completing your invoice format for reimbursement are provided below. Review them carefully.

(1) In the opening statement of the claim for remuneration on the invoice format, two dates are required. They are the date of your appointment letter from SCEEE (in the first blank) and the date you signed that letter accepting your appointment (in the second blank).

Other financial items required on the invoice format are for COMPENSATION, TRAVEL, EXPENSE ALLOWANCE, and PER DIEM. These are now explained individually with examples.

(2) COMPENSATION

(a) In the first blank to the right of COMPENSATION indicate the number of days you are claiming for compensation in this particular invoice next to your SCEEE Fellow daily rate of $105.00.

(b) Multiply this number by $105.00 and enter the total dollar amount in the blank at the far right side. The accumulated total number of days you claim on this appointment may not exceed the number authorized in your appointment letter. Specific details on the compensation days must be provided in the next space.

(c) Under the heading Date, list the date of each of the days you are claiming for compensation, and opposite each date under the heading Place of Activity indicate where you worked on that date.

A sample entry of a correctly completed COMPENSATION item is shown below:

SAMPLE COMPENSATION ENTRY ON INVOICE

COMPENSATION: (10 days @ $105.00 per day)..... $ 1050.00 (II)

Date (Specify exact dates)	Place of Activity
June 7,8 1984	AFAPL/POD High Power Lab
June 11-15, 1984 (inclusive)	WPAFB Computer Center
June 18, 19, 20, 1984	AFAPL/POD High Power Lab

(3) TRAVEL

(a) Under the heading Date indicate the date you departed on your trip and the date you arrived at your destination. If you are invoicing for a round trip, also list the date you departed on your trip and the date you arrived home.

(b) Under the heading Dept/Arrival Time list the departure and arrival times for the corresponding days you listed under Date.

(c) List your destination under the heading Destination.

(d) Under the heading Mode, indicate your principal means of conveyance; i.e., commercial air, private auto, etc.

(e) Under the heading Amount, itemize these expenditures for travel reimbursement. Continue them on a separate sheet if necessary.

(f) Total these travel items and enter the dollar amount for travel in this invoice on the line to the right of Total Travel Expense.

EXAMPLE A: PRE-SUMMER VISIT BY AIRLINE AND PERSONAL AUTO.

TRAVEL: (Attach receipts for all common carrier charges. Payment cannot be made without receipts attached to invoice.)

Date	Dept/Arrival Time	Destination	Mode	Amount
5/15-5/15/84	0730/0900	Tyndall AFB, Fl	Com'l Air	
5/17-5/17/84	0845/1345	Orlando, Fl (home)	Com'l Air	$53.00
2 round trips from home to Orlando Airport (Private Auto) (40 miles x 20¢ per mile = $8.00)				8.00
Total Travel Expense				$61.00(III)

Please note the following comments concerning EXAMPLE A:

i) The $61 is the sum of all listed travel expenses:

ii) Travel with use of privately-owned vehicle will be reimbursed at the rate 20¢ per mile; the mileage here does not exceed 100 miles;

iii) Receipts for the airfare must be attached in order for these charges to be allowed;

iv) Remember that SCEEE must give prior written approval for rental car use; without prior written approval, reimbursement for a rental car cannot be paid.

EXAMPLE B: TRAVEL TO RESEARCH LOCATION BY PRIVATE AUTO

TRAVEL: (Attach receipts for all common carrier charges. Payment cannot be made without receipts attached to invoice.)

Date	Dept/Arrival Time	Destination	Mode	Amount
5/25-5/31/84	0630/1530	Wright-Patterson AFB, Ohio	Private Auto	$480.00

One-way trip from home in Eugene, Oregon to Wright-Patterson AFB, Ohio, (2400 mi x 20¢/mi=$480.00)
(mileage at start: 24162; at end: 26562)

Total Travel Expense.....$ 480.00 (III)

Please note the following comments covering EXAMPLE B:

i) Travel by your private auto in lieu of a commercial carrier is authorized as a convenience to the traveler.

ii) Travel with use of a privately-owned vehicle will be reimbursed at the rate of 20¢ per mile provided mileage is listed with the start and end mileage on each separate use for all distances over 100 miles.

(4) EXPENSE ALLOWANCE

This item on the invoice will be used to claim the $35 per day for reimbursement of costs incurred at your assigned research location.

(a) In the first blank to the right of EXPENSE ALLOWANCE, enter the number of days for which you are claiming the expense allowance at your assigned research location.

(b) Multiply this number by the daily allowance rate of $35.00 and enter this total dollar amount in the blank at the far right.

(c) Itemize the days for which you are claiming the expense allowance reimbursement. It can include weekend days and holidays as well as regular work days. It does not apply to the pre-summer visit.

A sample entry of a correctly completed EXPENSE ALLOWANCE item:

EXPENSE ALLOWANCE: (14 days @ $35.00/day)..... $ 490.00 (IV)

Specific dates covered:
7/2/84 - 7/15/84 (inclusive)

(5) PER DIEM

This item will be used to claim reimbursement only for per diem charges on the optional pre-summer visit. This cannot exceed three days; only days spent at the actual research site are allowed.

(a) In the first blank to the right of PER DIEM enter the number of days reimbursement being requested. This entry must correlate with an accompanying lodging receipt.

(b) Multiply this number by the $48.00 daily per diem rate and enter the total dollar amount in the blank at the far right.

Example C below shows a correctly completed PER DIEM entry.

EXAMPLE C: PER DIEM ENTRY FOR PRE-SUMMER VISIT

PER DIEM: (2 days @ $48.00/day) ..... $ 96.00 (V)
Attach receipts for motel charges. Per diem cannot be claimed without receipts attached to invoice.)

Please note the following comments concerning EXAMPLE C:

i) Per diem is not applicable to travel time enroute to or from the research location;

ii) A day does not qualify for the per diem reimbursement without a corresponding lodging receipt;

iii) Each day requested for per diem reimbursement must be affirmed by a receipt for a night's lodging expense. The lodging receipt must accompany the invoice and must be consistent with the travel reimbursement entry. Note that receipts for lodging for the nights of 5/15, 5/16/84 must be attached in order for per diem of $48.00 per day to be paid and be consistent with the travel request as illustrated in Travel Example A;

iv) The per diem payment does not apply to the summer research period; for the summer research period use instead the Expense Allowance reimbursement entry.

(6) You may combine reimbursement requests for compensation, travel and per diem or expense allowance in the same invoice. The total for all items invoiced should be indicated on the blank labeled "GRAND TOTAL for INVOICE" in the lower right hand side of line 6.

(7) IMPORTANT: Indicate in the space provided on each invoice the address

address to which you want the check mailed.

(8) You must sign and date your invoice in the lower right hand corner as "VENDOR" before it is submitted; you MUST also have your Effort Focal Point countersign the invoice before it is mailed to SCEEE. Your Effort Focal Point is an Air Force individual at your research location who will be identified prior to your effort start date.

Invoices should be mailed to:

SCEEE SFRP OFFICE
1101 Massachusetts Avenue
St. Cloud, Florida 32769

SUMMER FACULTY RESEARCH PROGRAM
INVOICE FORMAT

1. I claim remuneration from SCEEE under the terms and conditions of the agreement dated _____ and accepted _____.

2. COMPENSATION: (_____days @ $105.00 per day).....$_____(II)

Date (Specify exact dates)	Place of Activity

3. TRAVEL: (Attach receipts for all common carrier charges. Payment cannot be made without receipts attached to invoice.)

Date	Dept/Arrival Time	Destination	Mode	Amount

Total Travel Expense.....$_____(III)

4. EXPENSE ALLOWANCE: (_____days @ $35.00/day).....$_____(IV)

Specific dates covered:

5. PER DIEM: (_____days @ $48.00/day).....$_____(V)
(Attach receipts for motel charges. Per diem cannot be claimed without receipts attached to invoice.)

6. GRAND TOTAL FOR INVOICE (Sum of II, III, IV, V above).....$_____(VI)

7. Please send check to following address:

8. I certify that compensation invoice is not concurrent with compensation received from other federal government projects, grants, contracts, or employment. Brief report of effort attached.

X _____
EFFORT FOCAL POINT SIGNATURE

X _____
Type or Print Name

Location of EFP _____

Telephone _____

Date _____

X _____
VENDOR SIGNATURE

X _____
Type or Print Name

Social Sec. No. _____

Telephone _____

Date _____

FOLLOW-ON RESEARCH POSSIBILITIES

As you are aware, the Air Force Office of Scientific Research sponsors the Summer Faculty Research Program. As a companion program intended to encourage further research work with the Air Force, AFOSR also sponsors the Research Initiation Grant Program. All SCEEE Fellows who have participated in the Summer Faculty Research Program are encouraged to apply for this valuable program. The Research Initiation Grant Program is also administered by SCEEE.

To compete for a Research Initiation Program award, SFRP participants must submit a complete proposal and proposed budget either during or promptly after their SFRP appointment period. The maximum award under the Research Initiation Program is $12,000 plus cost-sharing up to a matching total amount. The total funds available limit the number of awards to approximately 50, or half the number of 1984 SFRP participants.

The mechanics of applying for a Research Initiation Program award are as follows:

(1) Research Initiation Program proposals of $12,000 plus cost-sharing must be submitted after August 1, 1984 but no later than November 1, 1984. Proposals should be closely coordinated with the SFRP Effort Focal Point, relate to the SFRP effort and have strong prospects for later sustained funding by the Air Force laboratory/center;

(2) Proposals are evaluated and a final award decision is recommended by AFOSR after consultation with the laboratory/center;

(3) Awards will then be negotiated with the employing institution designating the individual as Principal Investigator, with the period of award having a start date no earlier than September 1, 1984 and a completion date no later than December 15, 1985;

(4) Employing institutions are encouraged to cost-share since the program is designed as a research initiation procedure. Budgets must include, where applicable, principal investigator time, graduate assistant and support effort, equipment and expendable supplies, travel and per diem costs, conference fees, indirect costs, and computer charges.

APPENDIX 1.B

PARTICIPANT'S QUESTIONNAIRE & REPLY SUMMARY

1984 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

EVALUATION QUESTIONNAIRE

(TO BE COMPLETED BY PARTICIPANT)

Name_____ Title_____

Dept. (at home)_____ Home Institution_____

Research Colleague_____

Laboratory Address of Colleague_____

Brief Title of Research Topic_____

_____

A. TECHNICAL ASPECTS

1. Was the offer of research assignment within your field of competency and/or interest? YES___ NO___.

2. Did you have a reasonable choice of research assignment? YES__ NO__
If no, why?_____

3. Was the work challenging? YES___ NO___. If no, what would have made it so?_____

4. Would you classify your summer effort as research? YES___ NO__.
Comment:_____

5. Were your relations with your research colleague satisfactory from a technical point of view? YES___ NO___ If no, why?_____

_____

_____

6. Suggestions for improvement of relationship._____

_____

_____

7. Considering the circumstances of a summer program, were you afforded adequate facilities and support? YES___NO___. If no, what did you need and why was it not provided?_____

_____

8. Considering the calendar "window" of ten weeks, limited by various college and university schedules, please comment on the program length. Did you accomplish: more than___;
less than___;
about what you expected___?

9. Do you think that you will continue this or related research efforts upon returning to your home institution by applying for a Research Initiation Grant or other funding: YES___ NO___. Give a brief explanation of your plans._____

_____

10. Were you asked to present seminars on your basic expertise or work? YES___NO___. Please list number, dates, approximate attendance, length of seminars, title of presentations.

11. Were you asked to participate in regular meetings in your laboratory? YES___NO___. If yes, approximately how often?_____

_____

12. Did you perform travel on behalf of the laboratory? YES___NO___.
Where to? _____
Purpose? _____

13. List any "special" meetings you may have attended or participated in, such as conferences, visiting lectures, etc._____

_____

_____

14. Other comments concerning any "extra" activities._____

_____

_____

15. On a scale of A to D, how would you rate this program?

	A (High).....			D (Low)
Technically challenging	A	B	C	D
Future research opportunity	A	B	C	D
Professional association	A	B	C	D
Enhancement of my academic qualifications	A	B	C	D
Enhancement of my research qualifications	A	B	C	D
Overall value	A	B	C	D

B. ADMINISTRATIVE ASPECTS

1. How did you first hear of this program?_____

_____

2. What aspect of the program was the most decisive in causing you to apply?_____

_____

3. Considering the time of year that you were required to accept or reject the offer, did this timetable cause you any problems of commitment? YES__ NO__.

4. After your acceptance, was the information on housing, location, directions, etc. supplied to you prior to the summer period satisfactory? YES__ NO__.

PARTICIPANT QUESTIONNAIRE (Page 4 of 5)

5. Did you have any difficulty in any domestic aspects such as, locating suitable housing, acceptance in community, social life, any other "off-duty" aspects? YES__ NO__. If yes, please explain. _____

_____

_____

6. How do you rate the stipend level? Meager__ Adequate__ Generous__.

7. How important is the expense-paid pre-program visit to the work site? Not worth expense__ Convenient__ Essential__. Please add any other comments you may have. _____

_____

_____

8. Please give information on housing: Did you reside in apartment__, VOQ__, other (specify)_____? Name and address of apartment complex and manager's name._____

_____

9. Please suggest names and give sources, of organizations, mailing lists or other information you think would be helpful in advertising next year's program._____

_____

10. Do you believe the Graduate Student Program increased the effectiveness of this program? YES__ NO__.

11. Did a student work with you? YES__ NO__. If so, please comment on the Graduate Student Support influence on your summer research._____

_____

_____

_____

PARTICIPANT QUESTIONNAIRE (Page 5 of 5)

12. Considering the many-faceted aspects of administration of a program of this magnitude, how do you rate the overall conduct of this program? Poor___Fair___Good___Excellent___. Please add any additional comments.

_____

_____

_____

13. Please comment on what, in your opinion, are:

a. Strong points of the program: _____

_____

_____

_____

b. Weak points of the program: _____

_____

_____

_____

14. On balance, do you feel this has been a fruitful, worthwhile, constructive experience? YES___NO___.

15. Other remarks: _____

_____

_____

_____

_____

_____

_____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(Participant)

A. TECHNICAL ASPECTS

1. Assignment in field of competency and/or interest? Yes -146
   No -001

2. Reasonable choice of assignment? Yes -143
   No -005

   If no, why?

   There was no choice. The subject matter was determined by the division head. One very interesting topic was suggested of the available project and I was delighted to have this opportunity. Had there been choices, I certainly would have ranked this opportunity as being highly preferred. Not many choices in optical astronomy. OEHL had some items to complete and this was a good chance to finish them. I was offered only one choice. My topic was well defined but allowed flexibility.

3. Work challenging? Yes -146
   No -002

4. Would you classify your summer effort as research? Yes -97
   No -04

   Comments:

   It was applications research. It provided me the opportunity to thoroughly search the literature for the problem I had proposed. Performed survey of literature to assist future research. Project had not been done before. Part research, part discussion, reviewing, and consulting. I planned and conducted an experimental study. Intense research, although some computer programming was also required. The effort was the initial feasibility study of a solution technique. Most of the time was spent evaluating and developing apparatus and instrumentation, which, of course must precede the data acquisition phase. Both analytical and experimental work was done. There is a good likelihood of one or two publications from this effort. Work can be considered research given the subject and the space flight conditions. Previous work was reviewed and inadequacies determined. I was essentially writing "statements of work". However, there are some good possibilities for follow-on research.

   I collected a lot of useful data. I have learned something new. The portion of the project which involved the computer simulation was research. The experimental portion did not materialize. I had opportunity to do the literature review and to help design what I consider to be a valuable research project. It was an applied project on a specific problem. The techniques were known; the application was new! In-depth study and analysis was a product of the assignment. My summer effort is definitely a research investigation. Work was a mixture of applied and pure research.

4. Comments: (continued)

New protocol for treatment was developed. Had to research several problems to apply toward existing or future problems. It was semi-directed but for 10 weeks that is an advantage. Basic research on synthesis of new materials. More like "development" of something that needed to be done but nobody else could do it. More scientific computing and engineering, not pure mathematics. Mostly evaluation, modification and recommendation of existing research. The nature of the work involved "selling" the ideas. A great deal of in-depth analysis was performed. Literature searches on the summer project indicated a viable area of research of interest to the Air Force. It required extensive review of related research, interviewing and surveying techniques to produce the end product. I had a very interesting project; applied research. The support staff and facilities afforded me an excellent opportunity to design and conduct a research experiment. The research is new, timely necessary and still on-going.

5. Were your relations with colleagues satisfactory? Yes -98
No -03

If no, why?

Portions of the windtunnel test were cancelled without consulting me. I held numerous interesting and instructive dialogues! AFRPL is only now redeveloping a competency in my research area; my research colleague was as supportive as possible under the circumstances. I had a clear picture of what I wanted to do and did it! Colleague did not consult about the research matter itself enough; he seemed too busy with other things and spent about 4 weeks away from the office. Technically, yes; personally, yes. I don't think the SCEEE SFR Program was well understood by OEHL personnel. The effort would have been more beneficial if I had been in a laboratory where pure research was being conducted, instead of a diagnostic procedure laboratory. My colleagues were very resourceful. Lack of interaction with my research colleague was poor due to his pending departure from AFHRL.

6. Suggestions for improvement of relationships:

Clearer understanding of the researcher's role in the effort. Clearly define the status of faculty fellows, so that they are not thought of as "summer hires". Our relationship was ideal. More contact before the summer would have been helpful. Assign an effort focal point who is directly involved with the particular research area, even if this person is not the branch chief; he was so busy, it was difficult to schedule planning time. The results were hasty decisions and later recognitions of, "we should have done something else"! Even though I had a pre-summer visit and some written materials concerning the research the group was pursuing, it still took too long to understand what was being worked on. The materials I received in advance were most helpful, but could have been even more comprehensive in scope, not necessarily in technical details.

6. Suggestions for improvement of relationships: (continued)

Relationship was outstanding including pre-summer planning and the excellent support while I was there. More dialogue, more frequent exchange of scientific information of mutual interest. More pre-summer time, if possible to address the problems of scheduling would be worthwhile. I was the first summer faculty member in this group: therefore, not everyone was aware of the program and its benefits and limitations. Many went to conferences and vacations during my visit. I was left frequently on my own. My relations were highly satisfactory; I can think of no way to improve the conditions. It might help to extend the program in some cases. All colleagues were helpful and competent. Much of the colleagues time was spent on other administrative duties. More advanced planning needed. It would have been more advantageous to have been assigned to an effort focal point person in pure research rather than applied research. It would have helped if I could have gotten a more specific understanding of what research the Air Force is interested in. More flexibility needed in working hours. For the benefit of the AF research colleague, the faculty member should submit a more complete resume' and list of interest.

Allow longer summer period plus a grant to continue during the fall and spring following the summer period. It may help if the AF Colleagues know a little more about the operation of the program. The accomplishments depend on how deeply the research project is embedded in on going research. Develop a laboratory assistant program to accomplish more work. Colleague should have allotted more time for discussions near the end of the period. It would have been better if colleague had more uninterrupted time for discussion and study of my work. Perhaps each of us should have been required to present formal lectures on our work. It helps if the fellow is informed if has to work with a contractor. My assigned research colleague should have a more permanent position within the organization. A good match of research interests is probably the key factor. More discussion on technical problems. The opportunities for tecnnical discussions were adequate. Accessibility of the computer facility should be improved. Increase the amount of interaction. There should be more collaboration between divisions; different divisions tend not to interact.

7. Were you afforded adequate facilities? Yes -133
No -012

8. Accomplishment in ten weeks? More than expected -32
Less than expected -34
About what expected-82

9. Will you continue this or related research efforts? Yes -139
No -006

10. Were you asked to present seminars? Yes -57
No -87

11. Were you asked to participate in meetings? Yes -84
No -64

12. Did you travel on behalf of the laboratory? Yes -027
No -121

13. Did you participate in "special" meetings? Yes -52
No -91

14. Please give other comments on extra activities:

Participated in RADC professional and social activities that regular employees participated in. Was treated very well as a respected member of the lab family! Participated in steak cookout and picnic. Visited EPA Research Facility at Gulf Breeze, Florida. I took advantage of some of the base recreational facilities. I was exposed to the different Air Force facilities and participated in more than one project. Flew several simulators and visited other labs. I observed many of the computer facilities. A tour of the base was helpful. Also, I worked with several offices other than the one I was assigned to. I enjoyed the officers' club. There were opportunities for cooperative research with staff members at Los Alamos National Laboratory, Sandia National Laboratories, Argonne National Laboratory, AFWL, and FJSRL.

We were invited to attend a lecture at the University of Tennessee Space Institute. The meetings with contractor representatives who developed the computer program used in this project were excellent. The meetings with outside technical experts were very informative, for my students and myself. I talked with other scientists in the branch about their current and future research work. A group luncheon honoring the participants of the Summer Faculty Research Program was a good idea; it allowed SFRP Fellows to meet each other and to meet AF officials connected with the program. I was allowed to pursue any topic related to my effort and had complete freedom to visit any library or laboratory I chose. This was an asset to the timely completion of my effort tasks.

I observed several tests in indoor and outdoor ballistic ranges. I was able to concentrate on my research. I would like to have seen more briefings by others in the lab on their research; there doesn't seem to be much of that sort of thing at HRL. I was invited to attend the meeting of human subject use review committee of the laboratory. Work was too concentrated and time demanding to get side-tracked with unrelated stuff. Travel money was available if I had needed it.

14. Please give other comments on extra activities: (continued)

I was able to discuss problems of interest with other members of the signal processing section. It was difficult to find out what meetings were going on and where. There were no "extra activities". The tour of Air Force research facilities conducted by the chief scientist was very beneficial. Solved a math analysis problem connected with the herbicide orange study.

	A (HIGH)		D (LOW)	
15. Technically challenging?	A-101	B-40	C-04	D-0
Future research opportunity?	A-109	B-31	C-05	D-1
Professional association?	A-099	B-37	C-10	D-1
Enhancement of my academic qualifications?	A-059	B-62	C-21	D-3
Enhancement of my research qualifications?	A-087	B-49	C-08	D-1
Overall value?	A-105	B-38	C-01	D-1

B. ADMINISTRATIVE ASPECTS

1. How did you first hear about program?

Colleagues	-58
Advertisement	-21
Air Force	-21
Direct mail	-46

2. Decisive aspect of application?

Area of possible future research funding	-36
Good research opportunity	-81
Opportunity to work with USAF	-19
Location	-05
Financial support	-04

3. Did the program timetable cause you any problems? Yes -019
No -128

4. Program information satisfactory? Yes -115
No -029

5. Did you have problems in domestic aspects? Yes -027
No -117

If yes, explain:

I had difficulty in gaining access to areas on the military base other than the work areas. Adequate housing at a reasonable cost was not available. I expected no help in finding housing and was therefore not disappointed. It was difficult to find an adequate off-base apartment with only a 10 week lease. The fact that we were allowed to stay in the VOQ was convenient and almost necessary.

5. If yes, explain: (continued)

I was not given help to find housing. "Social life" was minimal. The two dinners organized by the SCEEE representative were sub-standard. I was completely accepted into the social community. Almost more social opportunities than I had time for! Very limited choice of housing for 10 weeks. Everything went quite smoothly; the opportunity to bring along a graduate student made the relocation easier. You should provide a rent-a-car for the pre-summer visit. Also you should provide per diem for the trips down and back. SCEEE representative didn't find me housing; my family and I came to San Antonio, stayed in a hotel and found our own apartment. SCEEE representative referred me to an apartment locator, although I asked him more than once to find me housing. The per diem is not adequate. I could not bring my car; this made transportation, other than to work, a major problem; there was no city bus line. More complete information on housing should be provided befor the summer.

I got contradictory information on the availability of on-base housing; I was first told it was not available, and then after I had signed a lease, it was available. Difficulty in lodging and transportation. On the pre-summer visit I found out that the housing wasn't available in VOQ; I had been led to expect that it would be. I had to find housing for myself and two graduate students in a very brief period of time. SCEEE representative helped considerably. Some apartments were supposed to be good choices yet the manager said they would not rent for 10 weeks. Finding housing in Boston so as to stay within the per diem was difficult. I could not find anyone willing to lease only for ten weeks. Thus, I ended up renting both my apartment and furniture for periods longer than my actual use. My request for base housing was poorly handled. Several difficulties were encountered in determining whether or not there would be space available in the VOQ. Otherwise, the facilities were outstanding and the people helpful. Housing was difficult to locate and not much "off hour" social activity in the group I associated with. You do not expect one to form a new social life in ten weeks. It took work to locate housing in the "tourist trap" area that I could afford! Took "digging" to get permission to use base facilities (i.e., gym facilites, pool, etc.) as a DOD or non-civilian. Affordable housing is difficult to find.

6. Stipend level? Generous -010
Adequate -103
Meager -035

7. Pre-program visit? Essential -95
Convenient -33
Not worth expense -09

8. Housing information: VOQ -15
   Apartment -45
   Other -41

9. Mailing list suggestions?
   Refer to previous reports.

10. Addition of Graduate Student Program increased effectiveness of program? Yes -99
    No -15

11. Did a student work with you? Yes -50
    No -98

Comments on the Graduate Student Research on summer research:

Very helpful on my experimental project. The participation by my graduate student not only increased the number of experiments we performed but it was a valuable educational opportunity for him. Graduate Student provided essential support. I had two students with me; they learned a lot individually and provided me with information for the development of an RIP Proposal and a follow-up proposal. The research progress would have been severely limited without the help of a graduate student. My student learned a lot, was excellent in the lab and was eager to learn; what more could I ask? I would not have accomplished as much without the assistance of the graduate student.

The student helped me do library research and develop certain mathematical approaches. Another graduate student provided much useful stimulation. It is valuable to have student help in computations and discussions. The graduate student support can be a very positive factor; unfortunately, the student who worked with me was not as capable as she appeared from her transcript data. She was diligent but not very successful at performing experiments. Although she did not make a substantial contribution to the summer research effort, she received sufficient training to complete the research for her thesis.

The student who worked with me allowed me to spend my time more effectively than would be possible otherwise. This allowed me to get involved in more activities with the group in the lab. It is important for students to experience the pressures and payoffs of developing and delivering a tangible product. Of course, the student work overlapped to a degree with mine, which helped me in my work. We worked as a team, which was profitable to all of us. It gave different perspectives to the work. Help provided by two graduate students was essential for laboratory work and data analysis. They helped to take data and completed two projects.

11. Comments on the Graduate Student Research: (continued)

Some students did not have adequate research experience and this caused tension in operating the equipment. A medical student with prior Air Force service was assigned to work with me. He was very helpful especially in interfacing with the AF services. The assistance of the graduate student increased the level of my accomplishment by a factor of 5 to 10. I believe this student support is essential for achieving significant research results during the 10 week period. It allows the faculty member to spend more time planning the research and analyzing data. Student was helpful in discussing and working out the details in several areas; very strong. I guided him in the primary objective of summer work while I looked into extensions and embellishments. This student was good and is writing his thesis on the work we did this summer. I think the graduate students are underpaid. I had two students, neither of whom was from my institution.

It is difficult to supervise two students and do one's own research. One would have been enough. It is difficult to supervise two students and do one's own research. Especially, when the interest of the students do not coincide with one's own. The student's goal was useful in accomplishing more work. The student's programming work allowed me to do additional reading. The student's work supported my effort and was of good quality. Three graduate students came with me. Under the hostile environment of the host branch, their efforts have been severely hampered and their productivity has been minimal. It is essential, in my case to have the graduate students to support my work. Without their support, I would not be able to carry out all of the experimental work. My student runs the computer program for me so that I can concentrate on the analysis and research parts of the work.

I would have been without a graduate student for the summer if the Air Force program did not support them. This program allows students to do science and engineering. I spent more time in consultation than was anticipated; the graduate student was productive, but I was slightly constrained. Overall, the effect was beneficial. This student was an undergraduate and only spent a few days during my ten week period with me. The student program influenced me to accept this offer, rather than wait for the Navy (ASEE), since they did not indicate a student program. In terms of the actual research activity, much of it involved collaboration with the students. Very important part of any research work. Two students from another university were very helpful and I was able to teach them something too. They did some statistics work and helped me take data. Having a student allowed me to focus my attention entirely on the theoretical aspects of the problem with my graduate student concentrating on the experimental part.

11. Comments on the Graduate Student Research: (continued)

This allowed me to accomplish twice as much as I would have otherwise. Also, exposure of the student to a research laboratory environment was valuable experience. I was able to work with a person I knew and had worked with previously. Thus, I believe, I was able to become productive sooner. I was particularly interested in the clinical aspect of problem while my student was more oriented toward the environmental aspects. With the assistance of a student, I was able to accomplish much more than had I been alone. Furthermore, I believe the summer experience was a great addition to his education. Two graduate students worked with me. One had to redefine his project which was very time consuming and did not support the overall project. Aside from this, the experiences were very good. There has been no immediate impact on my own research since my student is doing his research on a different problem from mine. However, his work in electromagnetic topology has suggested some areas in which I might find some problems of interest to myself and to AFWL.

My graduate student and I divided up the work we planned to do, and we worked closely. I relied on him for feedback as well as original thinking and input to the project. He deserves much of the credit for its success. He provided the same contribution to my research effort as would have been the case in an academic setting, only the student learned much more because of the overall applied emphasis. My time could have been more efficiently used if I had had a graduate student with me. Unfortunately it is not easy to satisfy citizenship and availability requirements at the same time. I believe that graduate student support is an important part of the SFRP Program. The electrophysiological measurements would have been impossible to do without the assistance of a student. My home department also views the training of a student during the summer as a very positive aspect of the program. I was fortunate to have a young lieutenant work with me. We were supported by a student from Ohio State University. Technicians were available to help construct apparatus. A student worked on a different aspect of the LAIRTS Program, one which is important for the both of us in terms of continued research. Although we each concentrated on our own aspects of the program, we collaborated in discussions.

12. Program administration overall rating:

Excellent	-113
Good	-032
Fair	-003
Poor	-000

13.A Comments on the strong points of the program:

Exposes faculty members to the AF research needs. Allows the AF to use talents and expertise of faculty members. Develops working relationship between the AF and academia.

13.A Comments on the strong points of the program: (continued)

Opportunity for university staff to become involved in state of the art scientific efforts, to make off campus professional contacts and enhance future research opportunities. Opportunity to get away from normal responsibilities and a chance to learn new applications of skills and relationships with people. Better two-way communication between the Air Force and universities that leads to mutual understanding of research problems and capabilities. Establishes valuable links. New research opportunities, new professional associations, chance to see new parts of the world, general broadening of one's horizon! Excellent support by personnel at all levels; exposure to applied problems and experts in various areas; contact with researchers in the field; opportunity to work at the laboratory location; resources provided by the laboratory.

Exposure to advanced equipment and techniques; research enthusiasm. Opportunity to broaden my professional interests; opportunity to contribute to the understanding of problems of interest to a broad spectrum of professionals. The opportunity to visit the lab before beginning work is crucial. It made getting started in the summer much easier. The supportive environment of the lab was very nice. The opportunity for follow-on work is probably the best aspect of the project. Transfer university expertise to applied lab setting, and visa versa. The AF labs get top punch for their dollar, and the faculty scholar feels professional by continued exchange between Air Force research labs and academia. Opportunity to make research contacts and work on relevant research topics. Opportunity to increase understanding of USAF scientific needs and to establish long range cooperation between universities and DoD. Rapidity of selection; possibility of continuing support. Excellent opportunity to do worthwhile research. Enhances opportunities for funded university research. Interaction between academic institution and military practical problems; this interaction will strengthen the understanding of basic principles.

This has broadened my research spectrum and given me a chance to appreciate my colleagues work and to exchange technical experiences. Excellent facilities, library, computer travel via blue buses was excellent (they run on time). Freedom to do research with the effort focal point. Interaction with USAF Scientists; good facilities. Efficiently run, exposes university faculty to various technical research problems faced by the Air Force. It provided scholars the opportunity to pursue research interests that otherwise may not have been available to them. Opportunity for new avenues of research and research funding. Boundless exposure to interesting and creative research environment at WPAFB. Program is well organized and coordinated. Excellent facilities, good Air Force cooperation. Opportunity to study new and interesting problems, make contacts for future research efforts, and study independently.

13.A Comments on the strong points of the program: (continued)

Opportunity to become involved with the research activities of the Air Force. Program has allowed for initiation of new research area with excellent support. An excellent opportunity for the college faculty to have a first-hand experience with the different kinds of research projects of interest to the Air Force. Establishing contacts with a group of people away from home institution. It enables the participant to spend full time on research, without teaching or administrative duties. Early selection is very important. Excellent administration. Good academic value. Interesting activity offered to faculty. Technical excellence of AF personnel; RIP. Provides an opportunity for meaningful and significant research. Contributes to professional growth and development. Enhances research capabilities. Interaction with current research. Pre-summer visit, follow-on research initiation program, expense money, graduate student program. Provides an opportunity to work with professionals in government labs and establish contacts.

Future research opportunities. Gives the people a better awareness of what AFOSR and the labs expect from university interaction. Working conditions, cordiality of personnel, high morale. Fine opportunity to do non-academic laboratory research. Good exposure to real world problems. The many types of work available; the enthusiasm of the Air Force personnel for the program; the excellent administration of the program; the emphasis on follow-up work. Interesting and challenging problems. Good, not perfect, computer support. The opportunity to participate in a major program in a meaningful way for ten weeks. The opportunity to continue research with a follow-on grant. The facilities available on the AFB, the potential for future research collaboration with the Air Force. Interaction with Air Force research people, isolation from regular university work helps concentration on research. The opportunity to work with people tackling practical problems and apply academic knowledge. Was organized very well.

Graduate Student Support, opportunity to interact with AF researchers. Good short term opportunity. Needed change from academic life. Good exposure to the Air Force Research concerns and personnel. Good avenue for furthering research efforts of mutual interest. Excellent opportunity to make contacts and develop new or additional expertise in an area of high tech interest. Placement in area of specialty, good compensation level. It is an excellent vehicle for establishing relationships between faculty members and the Air Force in a manner that is mutually beneficial. The future research opportunity, the professional association and the enhancement of both research and academic qualifications. Making contacts for future investigative contracts; use of unique facilities. Placement of participants into appropriate settings; opportunity to work with very knowledgeable colleagues.

13.A Comments on the strong points of the program: (continued)

It gave me an opportunity to get involved again in scientific computing and military work in a congenial atmosphere with intelligent colleagues from whom I learned a great deal. The program is excellent for getting started on research in terms of time and money and opportunity. Interaction with Air Force scientist; appreciation of Air Force research priorities. I was able to view the manner in which the Air Force approached scientific problems. The research initiation program will enable me to be competitive in applying for research funds. Opportunity to interact with personnel at the HRL. To find out the important issues of research work in the Air Force. Chance to work in the Air Force research program. Highly informative. Chance to use advanced hardware/software. Integrating researchers from disparate backgrounds into work programs of mutual interest. Enabling basic researchers to engage in applied research of great importance. It is a good program only when interacts with active research personnel. Good research collaboration. Gives faculty a chance to get away from summer teaching.

Opportunities for new research opportunities, professional contacts, educational enhancement, travel opportunities. Allows college and university scientific faculty exposure to areas of military related research. The actual research effort and the follow-up opportunities are the main strong points. The relationship with the EFP is crucial since he must be willing to give of his time. I believe the program is outstanding. It allows the kind of contact that is essential for research initiation. It is unfortunate that there are not other programs like SCEEE. Effective way to make contact with Air Force personnel and Air Force problems. An opportunity for faculty to work in a research environment, thus gaining real background and experience in state-of-the-art technology. It presents an opportunity to deal with state-of-the-art problems. The faculty members get a chance to work in high technology area. Opportunity to obtain future projects. Chance to meet professionals in the field.

Allows faculty to conduct research where necessary facilities are accessible. The pay is good, the research opportunity is flexible, and the possibility to follow-up support is attractive. Professional association with Air Force scientists and their programs. Exposure to Air Force research interest, the opportunity to associate with professional colleagues, to perform significant research on instrumentation not available at my university, to get ideas for the future direction of my own research upon my return home, and to have summer employment. Opportunity for researcher to work on a problem of his choice and of interest to the Air Force. The opportunity to study a topic without the continual interruptions of campus activities and the possibility of sustained funding for graduate students and for graduate student participation.

13.A Comments on the strong points of the program: (continued)

From my point of view, the research area, the support here at USAFSAM, the potential for further funding, the salary, nearly perfect administration, and the technical assistance of a fine student. Research association, professional advancement assistance, and personal contacts. Clear explanation of research goals; opportunity for significant research; excellent support services; good turn around on reimbursement requests, questions, and etc. from SCEE Office. Administration, time of appointment, laboratory locations, the chance to do applied technical work. Facilities, technical advice, future research possibilities. Research time, aoility to collaborate with others. The possioility of establishing a mutually beneficial long term association with AFOSR, access to laboratory equipment not available at the home institution, non-teaching summer employment. Flexibility in setting the date to start; prompt payments. Interaction between academicians and practitioners, with ooth learning from each other, serves as introduction to the types of research the Air Force wants.

It took college personnel into a different setting to work on problems at that setting. This gave both the people at the base and us a different perspective to the work. This was truly cross-fertilizing. Opportunity to conduct research relevant to national defense programs and interests. Availability of sophisticated research equipment and computer facilities. Yes, this is a good program and this is especially true when one is associated with a professional like AFWL, Plasma Physics Group. The opportunity to observe first hand, some of the research in progress at USAFSAM. Learn first-hand about USAF research activity, contract procurement and administration, and available capabilities; opportunity to perform research away from university distractions and develop contacts with researchers and contract administrators; graduate student support is a terrific bonus. Chance to make contact with several individuals in the Flight Dynamics Laboratory, and to learn what problems they think are important, chance to review a specific area up to the level of being relatively competent.

Graduate student colleague, talented research colleagues, good research facilities and equipment opportunity for further research. I was able to meet people and gain a better understanding of the type of problems that are of interest to the Air Force. Provides an opportunity for establishing contacts in Air Force and increases the chances of getting research grants from AFOSR. The program is effective in establishing contacts and exchanges of views between the academic community and the government laboratories. Excellent way to learn what the Air Force is interested in. Meaningful/utilitarian research opportunities. Research possibilities. The program is well managed, giving opportunity to academicians to work in government laboratories.

13.A Comments on the strong points of the program: (continued)

Provided the opportunity to use CRAY supercomputer, which I don't have access to at the university. Excellent facilities; research colleague was very helpful; parallel research by graduate student was stimulating; research environment was good. My research program fits in with existing research programs at WPAFB. The efficiency and turn around times are excellent. The people were very helpful. Getting out of my home institution for the summer, getting back into a productive environment and giving my family a neat summer vacation! Future research possibilities enhanced. Physically located in AF labs. The administration of the program. Provide a very effective way for an isolated university to establish contacts and learn about government sponsored research. Being able to interact with colleagues with various backgrounds. Collaboration between Air Force research personnel and academic community, and mixing of research ideas and expertise. Having the experts in this research field immediately available for discussions. The numerical algorithms and computer facilities were outstanding.

Opportunity to do research in relevant field. Opportunity to learn about applications and follow-on work. Excellent administration, good research facilities, friendly colleagues, stimulating environment. I had a very good experience overall. Interacting with non-academic individuals. Efficient operation; timely responses, total information available at beginning. Excellent and timely administration. An informal relationship between faculty and effort focal point. Opportunity for a period of intense research effort. Opportunity to expose academic personnel to the concerns and interests of the military. One has the opportunity to become involved in a research project which parallels their own interest with significant input into the formilation of the problem. Opportunity to have an inside view of the laboratory and activities. Contact with Air Force personnel working on the problems being researched. The opportunity to conduct research, learn about the world of the military, bring the academician in contact with other professionals, and to live briefly in another city.

Provide opportunities of research support to young faculty like myself. Opportunity to get quickly into a new research area. Research Initiation Grants permits continuation at home institution. Opportunity to concentrate on research problem in context of an ongoing program. Stimulation from colleagues. Provides research opportunity to many whose home institutions cannot support research efforts, provided professional contacts. Opportunity to interact with timely research program.

13.B Comments on the weak points of the program:

Acceptance date is too late to allow for proper acquisition of research material. My accomplished work was limited because one item ordered after my acceptance did not arrive until mid-July. Not enough contact with Air Force personnel working on the problems being researched. Inability to obtain supplies on short notice. Insufficient ways to provide firmer directions in the initial stages of the research effort. Insufficient pre-summer interaction; lack of formal opportunities for exchange of research information. Not enough guidance in writing research proposals. Not enough scientific communication at the laboratory. Too segmented. Need exists for cross fertilization. Obtaining equipment caused considerable delay. More advanced planning for experimental work. Some offices are actively hostile about your presence. Lack of knowledge as to what base facilities were open to SCEEE Researchers. I would have liked to see more interaction between participants in order to learn more about the other projects.

Graduate students find it difficult to meet front-end living expenses, apartment deposits, rent,without advance payments. I had to foot all their initial bills. The lock-step feeling of the program. Although I got as much done as expected, it would have been desirable to have more flexibility. Most academicians have other projects to support which can't be dropped for ten weeks. SCEEE should recognize this fact formally. I think that rests more with how the program is set-up. Compensation! Rigid working hours. Need to be away from home for so long. I could have done just as well, or better, working at home with a better library and making occasional visits to WPAFB. Funds were not allocated for the immediate procurement of necessary research chemicals and supplies. There is a temptation of Air Force personnel to use summer faculty as employee in order to make up for personnel shortages. Need more advance notice of acceptance; supplies take so long to order and receive. Should be able to place an order in January or February for the following summer. It might help to publish an early list of names and addresses of summer faculty so they might be able to get together on summer housing if interested.

Would like to see more organized activities for participants. Would be nice to have more opportunities to interact with other SFRP participants. Need stronger continuation procedures concerning RIP. It would also help to develop a program earlier. Perhaps a bit too much competition for the facilities. One had to coordinate the use of chemistry and optical facilities with others. At SAM/Brooks AFB the real laboratory space is limited, many people on the base seemed unaware of the program. Supportive services, clerical, library, and data processing were weak. The labs should plan ahead to make use of the man power and expertise. The Air Force facilities are the worst I have ever experienced. We have much better facilities at my university.

13.B Comments on the weak points of the program: (continued)

Maintenance is poor and support is lacking. Program requires participants to have "up front money" and some people may not be able to participate because of this. There were difficulties in communication with SCEEE Administration on housing, etc. Lack of communication between SCEEE and me. Lack of interaction among the fellow appointees. On-site monitoring and supervision of the program in the research laboratories did not seem adequate. Program is strong, why restrict it to US citizens? The follow through in terms of communications between SCEEE Administration and SCEEE Fellows could could be improved. Writing a long report with a definite format is very time consuming. Many government programs need only one or two page abstracts. The time frame is too rigid. Academic institution lacks the facilities to continue the work.

Far too many participants at WPAFB were local to the area and the University of Dayton. Less provinciality would increase research effectiveness through diversity. Reduce the learning experience aspect of the program. Faculty fellows should know beforehand what lab assignment is needed, and should be expected to accomplish it; more coordination between SCEEE and the effort focal point is needed. The laboratory was not prepared for my arrival, even though it was scheduled much earlier. Limited opportunities to attend professional society meetings. The almost mindless delays in scheduling repairs and alterations. Possibly improve match of faculty skills with assignment - could pre-program visit include overview of related areas with opportunity to change direction if a better match exists? This might maximize future research opportunities.

Compiled summation of other comments:

Length of program too short	-42
Pay too low	-20
Trouble in cashing checks	-07

14. Has this been a fruitful, worthwhile, constructive experience?
Yes -144
No -001

APPENDIX 1.C

RESEARCH COLLEAGUE'S QUESTIONNAIRE & REPLY SUMMARY

1984 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT'S RESEARCH COLLEAGUE)

Name _____ Title _____

Division/Group _____ Laboratory _____

Name of Participant _____

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site? YES___ NO___. If yes, where/how/what?_____

_____

_____

2. Was the Faculty Associate prepared for his project? YES___ NO___.

3. Please comment on his preparedness/competency/scope/depth of knowledge of subject area: _____

_____

_____

4. Please comment on the Associate's cooperativeness, diligency, interest, etc._____

_____

_____

5. In your opinion, has his participation in this summer program contributed to an increase in the Associate's potential to perform research? YES___ NO___. Comments:_____

_____

_____

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory? YES___ NO___. If yes, how?_____

_____

COLLEAGUE QUESTIONNAIRE (Page 2 of 3)

7. Would you classify the summer effort under the SFRP as research? YES___ NO___. Comment: _____

8. Was a Graduate Student assigned to your group this summer? YES__NO__. If so, did this enhance the research productivity? YES___ NO __. Was it an administrative burden? YES___NO___.

9. Were your relations with the Associate satisfactory from a technical point of view? YES___ NO___. Suggestions as to how they might be improved: _____

_____

10. Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence? YES___NO___. Comments: _____

_____

11. Do you feel that the introduction to each other, together with the summer work experience and performance could form a sound basis for continuation of effort by Associate at his nome institute? YES___NO___. If yes, how? _____

_____

If no, why not? _____

_____

12. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective do you think this program will be in that respect? (high) A B C D (low).

13. Also, please evaluate:

	A (high).....D (low)			
Opportunity to stimulate group activity	A	B	C	D
Professional association	A	B	C	D
Program administration	A	B	C	D

COLLEAGUE QUESTIONNAIRE (Page 3 of 3)
B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program? _____

2. Were you involved in the screening and prioritizing of the faculty applicants for your lab? YES___ NO___. If yes, do you have any suggestions for improvement of the procedures used?_____

_____

3. How do you rate the importance of the expense-paid pre-program visit to the work site? Not worth expense___ Convenient___ Essential___. Please add any comments:_____

_____

4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish more than___, less than___, about what you expected___? Comments: _____

_____

5. Would you desire another Faculty Associate to be assigned to you and/or your group/division? YES___ NO___. If no, why not?_____

_____

6. Would you desire additional Graduate Students in this program? YES___NO___.

7. Should the Graduate Students continue to be assigned to research <u>with</u> the Summer Research Faculty Member? YES___ NO___.

8. Should Graduate Students also be assigned <u>without</u> Summer Research Faculty supervision? YES___ NO___.

9. Other remarks:_____

_____

QUESTIONNAIRE EVALUATION SUMMARY
(Research Colleague)

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of associates' capabilities? Yes -65
No -48

2. Was associate prepared? Yes -104
No -009

3. Comments on associate preparedness in subject area:

Associate had previous knowledge in composite materials. Very good depth. Previously performed summer research in his lab. Prepared in advance with literature research. Not enough time for the professor to coordinate with me prior to start of program; he is very competent in the area of testing materials. The professor was able to effectively bring this expertise to bear on composite testing during his stay. The applicant is a professor of mechanical engineering and teaches courses in the area of metalworking. Professor has good general knowledge about the finite element method, but lacked specific experience with modeling plasticity problems. Faculty member was competent in the use of TEM and SEM techniques which form the basis for his work here. Participant was very well prepared and demonstrated competence, having good depth of knowledge of subject area. Professor teaches various courses in ceramic engineering and has an excellent knowledge for image processing research.

Professor prepared an approach and agenda for the summer effort associated with modeling the light gun performance prior to arriving at Eglin. Professor was very knowledgeable of subject. Participant was extremely intelligent and capable mathematician. He came well prepared by reading numerous references to our project. Associate had excellent optics background. Professor fully planned and prepared for the experiments this summer. Workers had been exposed to image processing concepts and some of the related mathematics through their association with professor. Before this summer's work their exposure was limited. Excellent knowledge and ability. He is a well known worker in the field with several published papers and considerable experience.

Excellent. Professor did work in an area largely developed by himself and an associate. Candidate had worked with a thin-layer navier stokes computer code before and had it ready to run. Associates experience in running the fluid dynamics prediction program was essential in accomplishing the research objectives. Associate was very well prepared and competent to accomplish the work. He had read all of the suggested background material prior to arrival. He understood the problem well enough that he was able to suggest areas of mutual interest. His background knowledge in applicable areas was extensive. Professor is an outstanding experimental physicist who has a fundamental knowledge of what can and should be done to understand the problem areas in a physics research project.

SFRP Questionnaire Evaluation Summary (Research Colleague)

3. Comments on associate's preparedness: (continued)

Associate had an extensive background in experimental plasma physics, which is key element in the plasma armature railgun. The participants project area involved laser mode-locking, an area he had done Ph. D. dissertation work in. The participant had prepared additional background in characterizing the cellous species we used in our work. Faculty member was well established in the field of research in which he participated. Dr. was knowledgeable of Raman Spectroscopy having worked for a student of Raman. Professor was prepared and fully competent to conduct AE research. Our lack of modern acoustic emission (AE) equipment was major drawback. Fully prepared and competent to apply his knowledge. Scope and depth greatly above our groups knowledge in the particular area. Very competent in mathematics and dynamics. Faculty member was very cooperative, exceptionally diligent, and demonstrated a very nigh level of interest in his project.

Professor has a good background in solid mechanics and this was essential in his work on armor attachments. Associate had made a literature search and had studied pertinent papers dealing with rail guns prior to his arrival at Eglin. Associate had a background and experience that matched well the internal goals of the laboratory program he was assigned to. Prior research and work in the subject area made associate ideally suited to address application of distributed data base architectures to military systems. Associate was well prepared to investigate the topic area through independent research and review which he accomplished prior to his arrival. Had previous experience with Monte Carlo calculations in Molten Salts. Had good knowledge in areas of optics and fibers but had no particular expertise in gyros, control, or optical resonators.

Unsurpassed in all. Excellent/outstanding/very broad/very deep. Professor quickly learns what he doesn't understand. Associate is quite intelligent and dives deep into his area of expertise. He came with a good basic knowledge of the methods needed to accomplish the work. He had some background in the specific research area and very quickly picked up the additional detail knowledge to complete the task. Excellent. Associate has worked in this area for better than 15 years and has published original work in many related topics. Thru telecons and letters, we defined the project and he prepared by literature survey and library work for the specific approach we selected. Professor has a broad understanding of the signal processing area and an indepth knowledge of electronics. Associate has in-depth knowledge of radar backscatter characteristics and modeling.

Excellent. Having already had one of his graduate students do research at Brooks, there was no question as to associates expertise in this field. Associate looked good on paper, but proved to have fundamental problems and lack of skills. Superb preparation, outstanding competency. The scope of experience was narrow and the project was not well defined, thus the competency appeared to be less than anticipated. Associate was well prepared for the research work.

SFRP Questionnaire Evaluation Summary (Research Colleague)

3. Comments on associate's preparedness: (continued)

Based on previous experience she is well prepared, well scoped and imminently qualified. Associate is a world authority on the theory of perception and action. He is a series editor on the topic for a major science publisher. Professor arrived at AFAMRL with the software required to support his research pre-ordered by AMRL and a back-up copy running on an university computer. He also used his pre-visit effectively to select AFAMRL experiments run previously which could be used to test extensions to structural equation modeling and provide AMRL additional research insights. Associate demonstrated very early that he possesses an extensive knowledge of information systems. Professor was extremely well prepared. During his pre-program visit, he arranged to have experimental procedures in progress when he arrived on station. Was completely prepared to work in our laboratory and had in-depth knowledge of the research. The project chosen in pulmary and circulatory systems mechanics and modeling is exactly in associates technical field of expertise which is fluid mechanics of biological systems.

Associate studied literature in biomechanical protection prior to arrival. The study that he accomplished was thorough and provides in-depth coverage of both analytical and experimental aspects of the problem. Associate proved himself to be a highly competent individual. Professor being actively engaged in analogous research was very much prepared for this research project. Associate has an excellent background in physical chemistry which enabled him to successfully attack the research problem concerning electrochemical properties of synthetic lubricants. Excellent depth and preparedness. Prior to his tour of duty, associate came in and discussed his research project with us and received reports, papers, etc., to help prepare him for his project. He was familiar with the problem and the reasons for AF interest.

The associate was assigned to perform work in an area in which he possessed adequate knowledge to perform with competence. Well prepared, knows his subject very well. Well suited to topic. Participant was well-prepared and totally competent in his field of industrial psychology, having over thirty years experience in addition to the Ph.D. While specific knowledge of the functions of a wind tunnel laboratory was limited, the participant learned rapidly and evinced rapid comprehension. His previous experience apparently served him well in placing his new environment into perspective. Participant was totally prepared and competent in his field of industrial psychology, having over 5 years consulting and teaching experience in addition to the Ph.D. Although his knowledge of wind tunnel test techniques was limited, he learned quickly and demonstrated rapid comprehension and interest in his task. His previous consulting work was germane and no doubt helped him place the current task into proper perspective. Previous work and training in data acquisition systems, computer hardware and software applications and data uncertainty analysis made participant well suited in competency, scope, and depth. Adequate in all areas.

SFRP Questionnaire Evaluation Summary (Research Colleague)

3. Comments on associate's preparedness: (continued)

The expert in multi-level OB analysis. Individual was well equipped for the task. Provided many fresh, new ideas and views of current literature. He impressed all who worked with him and was an asset to the organization overall. He had previous knowledge in the area and was well-prepared to continue. Excellent in all areas. Highly prepared and competent-recognized as a leader in his field. Associate was extremely well prepared to develop standard approaches to Air Force fleet analysis and his expertise with small computers has allowed him to translate that knowledge into the beginnings of an easy to use microcomputer-based analysis system. Associate is presently a graduate student with fundamental knowledge and concepts in general technical area of subject and research. The research project for 1984 was based upon research performed by the faculty associate in 1983.

Associate was exceptionally prepared for the scope of the work performed under this effort. Faculty member had spent some time reviewing the literature we suggested for reading. Associate has a code reading for our computational modeling and also has experimental experience that is very helpful to our in-house work. He has done much military cost estimation. Highly qualified, has much initiative, much interface with WPAFB agencies to gather background data. Good knowledge. Associate took advantage of the pre-assignment visit by discussing ideas with us; we related our ideas and directions we thought she could most beneficially accomplish for us and then she began to review the literature before she left; reprints were waiting for her when she returned. Completely satisfactory in all areas.

The research area was brand new to him although he has taught some basics in a related field. Associate thoroughly familiarized herself with the literature and technical difficulties related to the work she was to conduct. The associate failed to familiarize himself with the literature referred to him 3 months earlier, and did not submit his requests for supplies in a timely or reasonable manner. Exceptional! The associate arrived with a detailed plan of study and began collecting data, literally, on the same day he arrived in the laboratory. His scope and depth of knowledge in the subspecialty were superb. Good part background plus excellent motivation to read and learn. Associate is fully competent to carry out the work outlined by virtue of prior experience, specific preparation and his extensive professional knowledge. I see no lack of qualifications. This is a cooperation USAFSAM/AFIT project. He visited AFIT at WPAFB in May '84 before reporting here in June '84. His preparation and understanding of the project was notable. Associate participated in the previsit program and identified several areas of research in centrifuge technology. He has an extensive knowledge in Geotechnical Engineering and Centrifuge Technology and is extremely competent in computer simulation. Associate participated in the previsit program and identified several areas in centrifuge technology. He has an extensive background in centrifuge technology.

SFRP Questionnaire Evaluation Summary (Research Colleague)

3. Comments on associate's preparedness: (continued)

Associate is very competent in this area; geotechnical engineering and computer simulation. Associate came prepared with personal reference material and a list of references needed thru tech library. He is extremely competent and knowledgeable of the subject area. Excellent. Associate is well acquainted with research methods and environmental engineering problems. He prepared himself by studying background information related to this effort before arriving at the laboratory. He was quite competent in general area but had not worked with the specific class of chemical compounds prior to his arrival. Very thorough. Associate had previous work with non-intrusive optical measurement of spray droplets and it was good preparation for the work he performed this summer. A depth of knowledge in combustion and flame chemistry was quite evident.

Associate knew little of his assigned research area before coming but he quickly learned and became very conversant in all relevant aspects of it. Excellent. He already had necessary background information as a result of his work as a reserve officer and had made detailed preparations prior to arrival. Well-prepared on all counts. The associate possessed extensive general knowledge of subject area from education and literature and was immediately prepared to bring this knowledge to bear on the specific topic addressed. Very good. Participants asked us for background literature on the project beforehand and had assimilated it when he arrived. Very competent and experienced in applying operations research techniques. Was able to proceed immediately on developing math models that will be useful in the LOGAIR route selection and cargo allocation problems.

Professor is well prepared - competent. At my invitation, while he was here this summer, Professor gave a seminar (Band Model Parameters in Lowtran) to the optical physics division on his previous research. Associate was extremely well prepared to develop standard approaches to Air Force fleet analysis and his expertise with small computers has allowed him to translate that knowledge into an easy to use microcomputer-based analysis system. Associate arrived at the LMC thoroughly prepared to dissect and research the background of AF Manual 28-345 and then reconstruct the manual for easier readability. She wasn't disillusioned by the fact that she had no prior knowledge in AF Logistics.

Associate contacted us beforehand and knew what was necessary. He knows the topic well. He is a recognized leader in turbulent combustion and spray theories. Professor has extensive knowledge in the areas of quantum theory of critical processes. He had prepared for the summer research by giving considerable thought to applying this theory to turbulent mixing problems. Associate had expertise in analytical benchmark solutions of the transport equations is widely known in the "transport" community. It is a privilege for me to have him here.

SFRP Questionnaire Evaluation Summary (Research Colleague)

4. Comments on associate's cooperativeness:

Associate approached his work with diligence and innovativeness. He spent most of his time in the artificial intelligence laboratory, often working after hours. He continously displayed a high degree of professionalism, dedication to work and cooperative attitude during his stay at ESD/XR. Professor was extremely dedicated and conscientious in performing the assigned task. Very easy to get along with. Associate worked very hard both in the lab and in the library. Very enthusiastic and willing to spend much effort to learn new areas. Extremely amenable and hard working. Professor is a hard worker and can easily communicate with others. Associate attempted to talk to every expert in the field of adaptive learning systems.

Associate was very dedicated to completing the effort, not just as a job, but because of personal interest as well. He fully intends to continue research in this area on his regular job. We worked very well together; he was quite willing to take suggestions. Associate approached this assignment with his usual dedicated attitude resulting in a very harmonious working experience. Excellent worker, pursued project very well and as a bonus provided my people with several lectures on magnetics at his own initiative. Appears deeply interested in our technical problems and has already accomplished more than I expected for the entire period. Highly interested in the work - plans to apply for a grant to continue. I have found associate to be an outstanding person of high moral character and intelligence.

Generally uncooperative and despondent. Avoided interaction and involvement in activities. Highly motivated to maximize summer achievements. Diligent and dynamic to an impressive degree. Worked hard and listened hard. He came wanting to learn everything. This associate was cooperative, but was not interested to degree that would create dedication. Associate was extremely interested in this work and the high quality of his contribution reflected his interest very well. Associate is very cooperative, interested in all aspects of her project and ours working diligently to accomplish the tasks. Very cooperative, appears to work 10-12 hours a day, 7 days a week. Performed an exhaustive survey of AFAMRL experimental data bases. He overcame the effects of a serious injury to complete the program.

He has shown a genuine interest in the AFAMRL R&D and related information systems and actively researched associated problem areas. Works extremely well with all associates. Provided discipline and leadership underscored with enviable research talents. Was one of the best visiting scientists we have hosted.

4. Comments on associate's cooperativeness: (continued)

A very hard worker. Is highly cooperative and shows considerable interest and energy in pursuing chosen research task. Associate was extremely cooperative, diligent, and he demonstrated considerable interest in his research project as well as many other research efforts within this branch. Associate is a hard worker who is a good physicist and an easy person with whom to work. Showed this type cooperation behavior during his entire 10 week period. Diligently pursued and researched the facets of composite testing. Very cooperative, inquisitive, strong on ability to communicate with others. Associate was extremely cooperative and worked many extra hours to achieve a meaningful goal. We were impressed with her diligence.

Associate was extremely cooperative and worked well with students and other members of ceramic groups. His work resulted in a presentation and possible publication. He is very interested in this subject area and he and the graduate assistant are diligent in striving to complete the effort during their stay. Although a very hard worker, associate always took time to explain his work to others. A very pleasant worker and team-mate.

Both associates were highly motivated individuals. Cooperative, pleasant; added to our production. He and his graduate student both worked very hard and are clearly deeply interested in the work. I would be glad to have them come back again. Professor was very cooperative and showed a keen interest in our fluid dynamics technical problems. Unusually good cooperativeness and willingness to work despite several limitations imposed by working in government labs - i.e., non-availability of needed supplies, equipment breakdown and lack of immediate repair capability, etc. He was very helpful and suggested some improvements in experimental method. He spent 8-10 hours every work day on his research. Associate has developed a good working rapport with engineers, scientists, and technicians at all levels.

Professor was very diligent, even under the stress of certain supply shortages. His interest has led to the concept of various new approaches to the research problems. The associate was very cooperative and patient with supply representatives when obtaining crucial information from them. Associate was very cooperative in carrying out his research assignment. He has considerable interest and is very conscientious about his work. Highly motivated, hard worker. Associate is a hard worker who is a good physicist and an easy person with whom to work. Extremely cooperative, diligent and interested in our area of research. Could not have been better. He worked many extra hours. Associate is very cooperative and congenial. He has considerable interest and is very conscientious about his work.

SFRP Questionnaire Evaluation Summary (Research Colleague)

4. Comments on associate's cooperativeness: (continued)

Associate was extremely cooperative and diligent in his work. While waiting for AE equipment, he helped in working out a shear lag theory for composites. This resulted in two papers. Associate was very cooperative, exceptionally diligent and demonstrated a very high level of interest in his project. He was very cooperative, very flexible and a very good worker. Very diligent, cooperative and prolific in providing new ideas for a wide range of logistics applications. Works like a beaver. Since the task was perfect application of his expertise, the participant was very interested in his assignment, and attacked his work with enthusiasm. It would be difficult, if not impossible, to imagine a more cooperative and interested participant. His rapid comprehension of his new environment and enthusiasm in pursuing solutions was gratifying.

Work on odd shifts was accomplished without even the hint of displeasure. His entire demeanor was totally professional. Actively pursued technical solutions through literature research and study of AEDC acquition system. Desires a close working relationship with research colleague. He has made notable progress in an extremely short time. Associate was willing to learn; attained a high degree of interest and was highly motivated to perform research in subject area. He was extremely cooperative and diligent in his involvement in the work.

Associate was not here at the office very often to feel like he was a part of the group. He did not talk to us about his effort nor was he interested in feedback or our opinion about how to do his research. Despite family health conditions, associate has worked steadily and productively. The associate displayed a geat deal of ingenuity and tenacity. Her ability to cooperate with the group often resulted in a higher lever of productivity for the group. The associate displayed little cooperativity or interest in the research program. As a result, a number of objectives were not met. The associate has worked 9-10 hours per day and demonstrated a genuine interest in the research with a desire to redirect his own university research program to address issues of interest to our own government laboratory.

Associate was cooperative and very exact. He was interested in our project, worked on it very diligent, and was highly cooperative. He was very cooperative, very flexible and a very good worker. Very diligent, cooperative and prolific in providing new ideas for a wide range of logistics applications. Works like a beaver. Excellent. He was totally cooperative in all respects. Very cooperative in work assignment. Satisfactory in all areas. Associate highly motivated and a hard and fast worker. Associate is a worker and an achiever. The associate was outstanding in these attributes. He was extremely cooperative and diligent in his involvement in the work. Associate has shown a great deal of interest and cooperation with this task. He is very diligent, hard working, cooperative and very interested in the work.

4. Comments on associate's cooperativeness: (continued)

Excellent in all respects. He has been fully cooperative, deeply interested and his work habits have been a source of inspiration to me and my staff. He took right off and has continued at an admirable pace. The project has been thrown off-schedule because of procurement problems, and we had to restructure his role. He has been extremely helpful, cooperative, and flexible. His presence has made the alternate task possible. Associate is extremely cooperative, responsive, and worked very diligently on his research task. He worked overtime many times over the weekends, holidays, and late in the evening. Associate is extremely cooperative and worked very diligently on his research task. There were many times that the associate worked weekends, holidays and late evenings. Associate is enthusiastic in his research efforts, works long hours and often works on Saturdays and holidays. Excellent. Works hard and puts in extra hours. Very interested in the effort; hopes to publish a paper on the results.

Very cooperative and a keen interest in many different areas. He came to work by putting twelve + hour work days. He was able to both coordinate our past and future research projects and improve our in-house particle measurement capability. Outstanding in all areas! He spent a great deal of time in the evenings and on weekends working in the lab. Excellent. He knows what he has to do and does it. When he needs additional guidance, he seeks it on his own. A++ on all three and other attributes of the positive work ethics. He immediately established a good working relationship with other personnel; formed a work schedule which maximized both literature research and laboratory research; and maintained his work habits throughout the period of the program. Excellent for both. Very diligent, cooperative, and prolific in providing new ideas for a wide range of logistics and applications related to resource optimization.

Associate shows great interest in the work he is performing as well as friendliness and cooperation with his fellow workers. Great. Associate is a worker and an achiever. He has made notable progress in an extremely short time. Professor showed a keen sense of interest in the project. She exhibited enthusiasm in all aspects of her work. Associate has been cooperative and interested. We had some problems with copyright data but associate has cooperated to solve the problem. Excellent researcher. Very dedicated and hard working. Associate is enthusiastic about being here and is a heavy user of our computer facilities even after hours. He is grateful for the opportunity to be here and has been much stimulated.

5. Increase in associates' research potential? Yes -110
No -003

6. Did work performed contribute to overall laboratory mission? Yes -111
No -002

7. Would you classify the summer effort as research? Yes -109
No -004

SFRP Questionnaire Evaluation Summary (Research Colleague)

8. Graduate Student assigned to group this summer? Yes -36
No -77

Enhance research? Yes -43
No -04

Administrative burden? Yes -01
No -49

9. Were technical relations with associate satisfactory? Yes -108
No -005

10. Did the summer associate stimulate others? Yes -103
No -008

11. Will summer experience and performance form basis for continuation effort by associate? Yes -101
No -008

12. Effectiveness in respect to capabilities and availability to USAF:
A (High) D (Low)
A -60
B -27
C -04
D -00

	A (High).....D (Low)			
13. Opportunity to stimulate group activity:	A -72	B -30	C -4	D -1
Professional association:	A -83	B -28	C -1	D -1
Program administration:	A -58	B -43	C -7	D -1

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of program?

1975 -05	1976 -05	1977 -06	1978 -06	1979 -08
1980 -17	1981 -18	1982 -12	1983 -22	1984 -12

2. Involved in screening and prioritizing? Yes -71
No -41

3. Do you favor an expense paid pre-program visit?
Not worth expense -01
Convenient -31
Essential -75

SFRP Questionnaire Evaluation Summary (Research Colleague)

4. Please comment on program length. How much accomplished?
   More than -27
   Less than -14
   What expected -71

5. Do you want another participant? Yes -110
   No -003

6. Would you like additional Graduate Students? Yes -75
   No -27

7. Should Graduate Students continue to be assigned with faculty member?
   Yes -78
   No -06

8. Should Graduate Students also be assigned without faculty supervision?
   Yes -43
   No -50

9. Other remarks:

Associate is the second professor I have had under this program. The program is a boon and an unqualified success from any standpoint. (Mine, the laboratory, the professor and the home institution.) The program has been building in strength since it started. This was the best group of summer faculty we have had. This is a good program. With our shortage of personnel, we cannot afford the time to bring a student "up to speed." He would have to arrive already knowledgeable. Certain graduate students may work quite well here if they have an understanding of our goals and capabilities prior to their arrival. Usually the student is lost without the major professor and should be assigned only with him. The SFRP is an outstanding program for our laboratory.

A great program - thanks! Not enough government lab PI's recognize what an opportunity this program affords. This program is going to become more of an integral part of our mission accomplishment! Very good program - RADC/COTD is well pleased. This is an excellent program. The interaction, in general, between our folks and summer researchers has been mutually beneficial. Page length limitation on papers is awkward, should have increased length. I would like to be considered for another faculty associate next summer. Program could be extended from 10 weeks to 12-13 weeks - if professor wanted to. This would be very valuable. Very good program. Could use same associate again next summer. If associate applies next year, I would like to have him assigned to me. A small monetary resource fund should be made available to accompany the participant to cover small expenditures for critical supplies. The only administrative difficulty of some significance is the lack of local flexibility in office space.

9. Other remarks: (continued)

I believe the Summer Faculty Research Program is one of the most important programs in the laboratory. The laboratory is tasked with solving problems in basic technology which are related to weapon development. Our work has gained a great deal from this program through the last 7 or 8 years. It is essential to continue bringing in academic people to the labs. A good program. We all gained a great deal. Excellent program. Very valuable program for all involved. Security clearances would enhance the ability to become fully involved. Associate was notified very late of his participation in this years program. Thus, research objectives and approach had to be worked out after his arrival. This was done satisfactorily, but it is desirable and essential to do this ahead of time. Excellent result this year. Summer faculty member must be highly motivated and capable of independent function. A program benefiting both participants and Air Force. We as project officers should have more lead time and broader latitude in selecting our associate.

I sponsored 2 graduate students, 1 with and 1 without a faculty member. My second student (without a faculty advisor) was outstanding. Program is of great value although there may be occasional disappointments. I would like to have the same associate return next summer. Greatly appreciate technical contributions. Overall, I have been quite satisfied with the Summer Faculty Program. Overall, excellent program - would be nice if some vehicle could be established for us to send some research money to complete a project once professor returns to university. Excellent program of immense benefit to the Air Force. Understanding the practical nature of the day to day Air Force lab environment (ie contracting, not research), these people can easily get lost in the administrivia. That is their government counter parts, if any, often do not have the time to devote to productive associates.

APPENDIX 1.D

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & REPLY SUMMARY

1984 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

EVALUATION QUESTIONNAIRE

(TO BE COMPLETED BY LABORATORY REPRESENTATIVE)

Laboratory/Center _____

Name _____

1. How do you rate the correspondence, verbal and telephone communication, and other aspects concerning program administration?
Excellent___ Good___ Average___ Poor___. How could it be improved?

_____

_____

2. The participant selection process is two-fold: academic and technical. Did you have sufficient time to conduct an evaluation of applications?
YES___NO___. Comments: _____

_____

_____

3. Was the number of faculty researchers assigned to your organization satisfactory? YES___NO___. If not, how many would be desired?_____
How do you determine this number?_____

_____

4. Please rate the expense-paid pre-program visit:
Essential___ Convenient___ Not worth the expense___.

5. In your opinion is the ten-week time period an optimum length of time to develop a viable working relationship among the faculty researchers, students, laboratory/center personnel and programs? YES___ NO___. If no, what length would it be?_____
Other comments: _____

_____

_____

_____

6. Did your laboratory/center establish a seminar program, or other means, to "tap" the faculty associate's academic knowledge other than his research assignment? YES____ NO____. If yes, give description and evaluation._____

_____

_____

7. Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate assigned to your organization? YES___ NO___.

8. Did you have a formal exit exercise for each associate such as a final technical briefing presented to the organization management, a private interview, or other? YES___ NO___.

9. In your opinion, what was the overall quality of this year's participants as measured by attitude, technical competence, work habits, production and meaningful research accomplishment?
(Note: These answers will be held confidential.)

List Names	Superior	Excellent	Average	Poor

LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 3 of 3)

10. Do you believe the Graduate Student Program enhances the Summer Research Program? YES___NO___.

11. Was a student assigned under the Graduate Student Summer Support Program to your laboratory this summer? YES___NO___. If so, was their participation productive? YES___NO___.

12. Please furnish any recommendations you may have on improving the Graduate Student segment of the program. _____

_____

_____

_____

13. Please furnish any other comments or suggestion to improve the program in future years._____

_____

_____

_____

THANK YOU

QUESTIONNAIRE EVALUATION SUMMARY
(Laboratory Representative)

1. Rate correspondence?
   Excellent -17
   Good -06
   Average -00
   Poor -01

2. Sufficient time for evaluation? Yes -21
   No -01

3. Number of associates satisfactory? Yes -17
   No -06

4. Rate pre-program visit?
   Not worth expense -00
   Convenient -01
   Essential -21

5. Is the ten week period an optimum amount of time? Yes -18
   No -05

6. Was there an established seminar program? Yes -10
   No -13

7. Did the laboratory conduct a general briefing? Yes -19
   No -04

8. Was there a formal exit exercise? Yes -19
   No -02

9. Quality of participants?
   Superior -67
   Excellent -37
   Average -08
   Poor -02

10. Did the addition of a Graduate Student enhance the SFRP Program?
    Yes -21
    No -00

11. Was a student assigned to your laboratory? Yes -15
    No -08

    Was their participation productive? Yes -14
    No -00

12. Recommendations on improving the Graduate Student segment of program:

Assignments to laboratories should not be made until all labs have had a chance to evaluate the students. We contacted a student on the application deadline day and found that she had already been offered an assignment at another lab. The assignment procedure should be like SFRP.

12. Recommendations on improving the Graduate Student segment of program: (continued)

Preferences should be solicited from the applicants. All research colleagues are in agreement that no improvements, technical or social, are necessary. Everyone is extremely pleased with the program. Allow and promote rehire. Extend possible work period from the 10 week minimum to 13 weeks maximum for those students who want to work until the school year starts. The program is excellent as is. Allow graduate students without a professor. With the proper preparation (sufficiently narrow question) the students can prove very valuable. They should stay for 12 weeks. I believe the program was well managed and very productive. The instructions to participating graduate students should indicate that work efforts will be in accordance with laboratory direction and they should be technically competent to contribute.

A candidate selection list should be coordinated. The program is very satisfactory as now conducted. AEDC was very pleased with the management of the program. Changes should be made very carefully, because it is a well conceived, well run, and well managed program. The program is very satisfactory as now conducted. AEDC was very pleased with the management of the program. Only make changes that are absolutely necessary because it is a well planned, well run, and well managed program. SCEEE has done an absolutely outstanding job. We couldn't be more pleased. Students can have cash-flow problems; the ladies may feel a little anxious about being alone in a strange city; the students also need to coordinate work ahead of time with their professor, unless they are already working with him. The graduate student program is working very well. Make a concerted effort to assign Graduate Students to the professors.

13. Suggestions to improve the program in future years:

SCEEE has done an excellent job of improving the program during the past years. Due largely to SCEEE's efforts the SFRP and GSSR Programs have become viable resources in support of the Air Force Aerospace Medical Research Laboratory's researchers and scientists. The program is excellent as is. The benefits from the program could be improved if there were a formal procedure for continuing the association with the university participant after the summer program is completed (in addition to the Research Initiation Grant). The continuing program could take the form of a small grant and loan of equipment such as computing facilities.

Begin work on security clearances earlier. Encourage agency recruitment of superior college talent in order to insure a selection of applicants interested in the work and locations requestiong research. Do exactly what you're doing now. It is working well. AEDC is highly satisfied with the program management. I would like to point out that my personal thanks should be conveyed to all those at SCEEE that have helped me with the program. I have had 100% cooperation and feel that the people at SCEEE have made this one of the best managed contractual efforts in the USAF.

13. Suggestions to improve the program in future years: (continued)

SCEEE has done an absolutely outstanding job. That comment is based on 25 years of experience dealing with contractual service arrangements with numerous service contracts. We couldn't be more pleased. Suggest a small sum of money be made available to professors so they can buy "supplies" and bring them along; especially chemists, biochemists, neuro chemists; maybe only 1 in 5 would actually need funds. The USAF/OEHL did not know about the Graduate Student Program until very late this spring. Please include us on routine announcements next year.

APPENDIX II

A. Program Statistics

B. List of 1984 Participants

C. Participant Laboratory Assignments

1984 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

Conducted by
SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION, INC.

A. PROGRAM STATISTICS

1. Number of Air Force Installations (Laboratory/Centers) - 25

2. Applications Received (First Choice as Follows) - 450

APL	(W-PAFB)	- 23	HRL/OTR	(Williams)	- 9
AMRL	(W-PAFB)	- 33	HRL/MO	(Brooks)	- 11
AD	(Eglin)	- 19	HRL/ID	(Lowry)	- 15
AEDC	(Arnold)	- 7	LMDC	(Maxwell)	- 14
AL	(W-PAFB)	- 13	LC	(W-PAFB)	- 5
BRMC	(W-PAFB)	- 6	LMC	(Gunter)	- 4
ESMC	(Patrick)	- 2	ML	(W-PAFB)	- 22
ESD	(Hanscom)	- 19	OEHL/B	(Brooks)	- 0
ESC	(Tyndall)	- 39	RPL	(Edwards)	- 12
FDL	(W-PAFB)	- 32	RADC	(Griffiss)	- 46
FJSRL	(USAFA)	- 24	SAM	(Brooks)	- 36
GL	(Hanscom)	- 30	WL	(Kirtland)	- 22
HRL/LRL	(W-PAFB)	- 7			

3. Number of Participants - 152

Number holding Doctorate Degree	147
Number holding Masters Degree	5
Number holding Professor Rank	42
Number holding Associate Professor Rank	51
Number holding Assistant Professor Rank	55
Number holding Instructor Rank	1
Number holding Chairman Rank	3

4. Average Age of Participants - 42

5. Distribution of Participants Location

APL	(W-PAFB)	-10	HRL/OTR	(Williams)	- 3
AMRL	(W-PAFB)	- 8	HRL/MO	(Brooks)	- 4
AD	(Eglin)	- 9	HRL/ID	(Lowry)	- 2
AEDC	(Arnold)	- 4	LMDC	(Maxwell)	- 3
AL	(W-PAFB)	- 7	LC	(W-PAFB)	- 1
BRMC	(W-PAFB)	- 2	LMC	(Gunter)	- 3
ESMC	(Patrick)	- 0	ML	(W-PAFB)	-12
ESD	(Hanscom)	- 2	OEHL/B	(Brooks)	- 1
ESC	(Tyndall)	- 8	RPL	(Edwards)	- 5
FDL	(W-PAFB)	-10	RADC	(Griffiss)	-10
FJSRL	(USAFA)	- 7	SAM	(Brooks)	-17
GL	(Hanscom)	-13	WL	(Kirtland)	- 6
HRL/LRL	(W-PAFB)	- 5			

A. PROGRAM STATISTICS (Continued: page 2)

6. Disciplines Represented - 36

Accounting	- 1	Genetics	- 1
Aeronautics	- 5	History	- 1
Agriculture	- 2	Industrial Engineer	- 3
Astronomy	- 1	Math	- 58
Biology	- 20	Marketing	- 1
Bio. Engineering	- 3	Mechanical Engineer	- 35
Business Administration	- 2	Metallurgy	- 2
Chemistry	- 52	Meteorology	- 1
Chemical Engineering	- 8	Nuclear Energy	- 4
Civil Engineering	- 13	Operations Research	- 3
Computer Science	- 8	Pharmacology	- 1
Economics	- 6	Physics	- 70
Education	- 5	Physiology	- 15
English	- 2	Physical Education	- 2
English Management	- 1	Political Science	- 1
English/General	- 24	Psychology	- 37
Electrical Engineer	- 45	Sociology	- 6
Environmental Engineer	- 9	Speech Science	- 2

7. Number of States Represented - 40

Alabama	New Jersey
Arizona	New Mexico
California	New York
Colorado	North Carolina
Connecticut	North Dakota
Delaware	Ohio
District of Columbia	Oklahoma
Florida	Oregon
Georgia	Pennsylvania
Illinois	Rhode Island
Indiana	South Carolina
Iowa	South Dakota
Kansas	Tennessee
Louisiana	Texas
Massachusetts	Utah
Michigan	Vermont
Minnesota	Virginia
Mississippi	Washington
Missouri	West Virginia
Montana	Wisconsin

8. Number of Colleges/Universities Represented - 92

Alabama A&M University
Alabama, University of
Arizona, University of
Auburn University (3)
Averett College
Bowling Green State University
Brown University (2)
California State University
Carnegie-Mellon University
Cedarville College
Central State University
Clark College
College of Staten Island
Colorado State University
Colorado, University of (2)
Connecticut, University of
Dayton, University of (8)
Dillard University
Eastern Montana College
Florida International University
Florida, University of (2)
Gannon University
Georgia Institute of Technology (2)
Houston, University of
Howard University
Illinois, University of
Iowa, University of
Jackson State University (3)
Kansas State University (4)
Kansas, University of (2)
Kent State University
Le Moyne College
Louisiana State University (3)
Lowell, University of (5)
Massachusetts, University of
McNeese State University
Meharry Medical College (4)
Miami, University of (2)
Michigan, University of
Minnesota, University of
Missouri, University of (4)
Monmouth College
Morris Brown College
Motlow State Community College
New Mexico State University
New Mexico, University of
New Orleans, University of
N.C. Agric. & Tech. St. Univ.
North Carolina Central Univ.
North Carolina State Univ.
North Dakota State Univ. (3)
North Texas State University (2)
Northwestern University (3)
Norwalk State Tech. College
Oberlin College
Ohio State University (5)
Oklahoma State University
Oklahoma, University of (4)
Old Dominion University
Pennsylvania State University (3)
Pennsylvania, University of
Pittsburgh, University of
Purdue University
Queensborough Community College
San Diego State University
San Jose State University
South Carolina State College (3)
South Dakota School of Mines (2)
Southern Illinois University
Southwest Missouri State Univ.
Southeastern Louisiana Univ.
State University of New York
Sterling College
St. Cloud State University
Syracuse University
Temple University
Tennessee, University of (2)
Texas Lutheran College
Texas Southern University
Texas Tech. University
Texas, University of (4)
The Citadel
Tulane University
Tuskegee Institute
Vermont, University of (2)
Villanova University
Virginia Poly. Inst. & St. Univ.
Washington State University
Western Carolina University
Wilkes College
Wisconsin, University of
Wright State University (7)

B. LIST OF PARTICIPANTS

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Annalingam Anandarajah Assistant Professor S.D. School of Mines & Tech. Civil Engineering Dept. Rapid City, SD 57701 (605) 394-2443	Degree: Ph.D., Civil Engineering 1982 Specialty: Geotechnical Engineering Assigned: ESC
Dr. Gloria Anderson Chairman Morris Brown College Chemistry Dept. Atlanta, GA 30314 (404) 525-7831	Degree: Ph.D., Chemistry, 1968 Specialty: Organic Chemistry Assigned: RPL
Dr. Richard Anderson Professor University of Missouri Physics Department Rolla, MO 65401 (314) 341-4341	Degree: Ph.D., Physics, 1959 Specialty: Optics, Atomic and Molecular Physics Assigned: APL
Dr. Deborah Armstrong Assistant Professor University of Texas Life Sciences San Antonio, TX 78285 (512) 691-4458	Degree: Ph.D., Biopsychology, 1982 Specialty: Neurophysiology Assigned: SAM
Dr. Francesco Bacchialoni Associate Professor University of Lowell Dept. of Electrical Eng. Lowell, MA 01854 (617) 452-5000	Degree: Ph. D., Engineering, 1946 Specialty: Control Systems, Digital Signal Processing, Microprocessors Assigned: GL
Dr. John Bahng Associate Professor Northwestern University Dept. of Physics & Astronomy Evanston, IL 60201 (312) 492-7527	Degree: Ph.D., Astronomy, 1957 Specialty: Astonomical Instrumentation, Computer Programming Assigned: GL

B. List of Participants (continued: page 2)

Dr. James Baird
Professor
Brown University
Chemistry & Physics Dept.
Providence, RI 02912
(401) 863-3325

Degree: Ph.D., Physics, 1959
Specialty: Spectroscopy-laser, Microwave
Assigned: GL

Dr. Mukul Banerjee
Professor
Meharry Medical College
Dept. of Physiology
Nashville, TN 37208
(615) 327-6288

Degree: Ph.D., Animal Physiology, 1964
Specialty: Respiratory Physiology, Environmental Physiology
Assigned: SAM

Dr. Alan Bentley
Assistant Professor
Eastern Montana College
Dept. of Physics
Billings, MT 59101
(406) 657-2026

Degree: Ph.D., Infrared Astrophysics, 1980
Specialty: Infrared Physics and Astrophysics
Assigned: GL

Dr. Richard Bernhard
Professor
North Carolina State Univ.
Industrial Engr. Dept.
Raleigh, NC 27695
(919) 737-2362

Degree: Ph.D., Operations Research, 1961
Specialty: Engineering and Managerial Economics; Decision Anal.
Assigned: BRMC

Dr. Albert Biggs
Professor
University of Kansas
Electrical Engr. Dept.
Lawrence, KS 66045
(913) 864-4836

Degree: Ph.D., Electrical Engr., 1968
Specialty: Microwaves and Antennas
Assigned: AL

Dr. Louis Buckalew
Associate Professor
Alabama A&M University
Dept. of Psychology
Normal, AL 35762
(205) 859-7451

Degree: Ph.D., Phys. Psychology, 1984
Specialty: Physiological Psychology
Assigned: LMDC

Mr. Mike Burlakoff
Assistant Professor
Southwest Mo. State Univ.
Computer Science Dept.
Springfield, MO 65804
(417) 836-5930

Degree: M.S., Math/Computer Science, 1965
Specialty: Languages and Environments
Assigned: AL

B. List of Participants (continued: page 3)

Dr. Myron Calhoun
Associate Professor
Kansas State University
Computer Science Dept.
Manhattan, KS 66506
(913) 532-6350

Degree: Ph. D., Electrical Engr., 1967
Specialty: Digital Hardware and Software
Assigned: AD

Dr. Jeya Chandra
Assistant Professor
Pennsylvania State Univ.
Dept. of Ind. & Mgmt. Engr.
University Park, PA 16802
(814) 863-2358

Degree: Ph. D., Ind. Eng. and Operations Rsch., 1980
Specialty: Stochastic Processes
Assigned: SAM

Dr. Do Chang
Associate Professor
Averett College
Chemistry Department
Danville, VA 24541
(804) 793-7811

Degree: Ph. D., Chemistry, 1968
Specialty: Chemical Kinetics, Phase Transitions
Assigned: AD

Dr. Huei-huang Chiu
Professor
University of Illinois
Dept. of Mechanical Engr.
Chicago, IL 60680
(312) 996-3426

Degree: Ph. D., Aeronautical Eng., 1962
Specialty: Combustion, Fluid Mechanics, and Propulsion
Assigned: APL

Dr. Philip Chong
Assistant Professor
Dept. of Industrial Engr.
North Dakota State Univ.
Fargo, ND 58105
(701) 237-7223

Degree: Ph. D., Ind. Eng. and Operations Rsch., 1977
Specialty: Computerized Resource Planning and Scheduling
Assigned: LMC

Dr. Louis Chow
Assistant Professor
Washington State University
Mechanical Engr. Dept.
Pullman, WA 99164
(509) 335-1327

Degree: Ph. D., Mechanical Engr., 1978
Specialty: Heat Transfer, Fluid Dynamics
Assigned: APL

Dr. David Chung
Professor
Howard University
Department of Physics
Washington, DC 20059
(202) 636-7903

Degree: Ph. D., Solid State Physics, 1966
Specialty: Fiber Optics Sensors Ultrasound, Solid State Elect.
Assigned: FJSRL

B. List of Participants (continued: page 4)

Dr. David Cohoon
Professor
Temple University
Dept. of Mathematics
Philadelphia, PA 19122
(215) 787-7284

Degree: Ph. D., Mathematics, 1969
Specialty: Partial Differential Equations
Assigned: SAM

Dr. Frank Colby, Jr.
Assistant Professor
University of Lowell
Dept. of Earth Sciences
Lowell, MA 01854
(617) 452-2551

Degree: Ph. D., Meterology, 1983
Specialty: Boundary-layer Meteorology
Assigned: GL

Dr. Robert Colclaser, Jr.
Professor & Chairman
University of Pittsburgh
Electrical Engineer
Pittsburgh, PA 15261
(412) 624-5391

Degree: Ph. D., Sci., Elec. Engr., 1968
Specialty: High Power Arcs, Circuit Breaker Design and Test, Electrical Transients
Assigned: WL

Dr. Gregory Corso
Assistant Professor
Georgia Inst. of Tech.
School of Psychology
Atlanta, GA 30332
(404) 894-2680

Degree: Ph. D., Engr. Psychology, 1978
Specialty: Human Factors, Human Performance
Assigned: AEDC

Dr. Robert Courter
Associate Professor
Louisiana State University
Mechanical Engr. Dept.
Baton Rouge, LA 70803
(504) 388-5792

Degree: Ph. D., Aerospace Engr., 1965
Specialty: Aerodynamics, Gasdynamics, Blast Waves
Assigned: AD

Dr. John Cyranski
Assistant Professor
Clark College
Physics Department
Atlanta, GA 30314
(404) 681-3080

Degree: Ph. D., Physics, 1974
Specialty: Math. Physics and Information Theory
Assigned: GL

Dr. Subramaniam Deivanayagam
Associate Professor
University of Texas
Dept. of Industrial Engr.
Arlington, TX 76109
(817) 273-3092

Degree: Ph. D., Industrial Engr., 1973
Specialty: Ergonomics/Human Factors
Assigned: HRL/Wright-Patterson

B. List of Participants (continued: page 5)

Dr. Hermann Donnert
Professor
Kansas State University
Dept. of Nuclear Engr.
Manhattan, KS 66506
(913) 532-5960

Degree: Ph. D., Mathematics and Physics, 1951
Specialty: Plasma Physics, Radiation Physics
Assigned: FJSRL

Dr. Robert Dorman
Assistant Professor
Kent State University
Dept. of Biological Sci.
Kent, OH 44242
(216) 672-3613

Degree: Ph. D., Physiological Chemistry, 1976
Specialty: Neurochemistry
Assigned: SAM

Dr. George Doyle, Jr.
Associate Professor
University of Dayton
Mechanical Engr. Dept.
Dayton, OH 45469
(513) 229-2835

Degree: Ph. D., Mechanical Engr., 1973
Specialty: Dynamics
Assigned: FDL

Dr. Eric Drumm
Assistant Professor
University of Tennessee
Dept. of Civil Engr.
Knoxville, TN 37996
(615) 974-7715

Degree: Ph. D., Civil Engineering, 1983
Specialty: Geotechnical Engineering
Assigned: ESC

Dr. Charles Drummond, III
Associate Professor
Ohio State University
Dept. of Ceramic Engr.
Columbus, OH 43210
(614) 422-2960

Degree: Ph. D., Applied Physics, 1974
Specialty: Glass Structure and Properties
Assigned: ML

Dr. Delcie Durham
Assistant Professor
University of Vermont
Civil & Mech. Engr. Dept.
Burlington, VT 05405
(802) 656-3320

Degree: Ph. D., Mechanical Engr., 1981
Specialty: Metal Behavior at High Strains and Strain Rates
Assigned: ML

Dr. Terrence Dwan
Associate Professor
The Citadel
Dept. of Elect. Engr.
Charleston, SC 29409
(803) 792-5057

Degree: Ph. D., Elecrical Engr. 1975
Specialty: Large Scale Systems, Modelling, Controls
Assigned: AD

B. List of Participants (continued: page 6)

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Professor
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Dept. of Aerospace Engr.
Dayton, OH 45469
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Degree: Ph. D., Aeronautics, 1968
Specialty: Aeroelasticity
Assigned: FDL

Dr. James Eberhart
Professor
University of Colorado
Chemistry Department
Colorado Springs, CO 80933
(303) 593-3284

Degree: Ph. D., Chemistry, 1963
Specialty: Physical and Surface Chemistry
Assigned: FJSRL

Dr. Frederick Eisler
Associate Professor
College of Staten Island
Dept. of Applied Science
Staten Island, NY 10301
(212) 390-7973

Degree: Ph. D., Physics, 1970
Specialty: Particle Physics, Holography, Accelerators
Assigned: WL

Dr. Emory Enscore, Jr.
Associate Professor
Penn. State University
Dept. of Ind. & Mgmt. Syst. Eng.
University Park, PA 16802
(814) 863-2353

Degree: Ph. D., Ind. Engr., 1972
Specialty: Industrial Engineering
Assigned: HRL/Wright-Patterson

Dr. John Erdei
Assistant Professor
University of Dayton
Dept. of Physics
Dayton, OH 45469
(513) 229-2727

Degree: Ph. D., Physics, 1983
Specialty: Many Body Theory, Critical Phenomena
Assigned: APL

Dr. Adly Fam
Associate Professor
State University of New York
Dept. of Electrical & Comp. Eng.
Buffalo, NY 14260
(716) 636-2422

Degree: Ph. D., Electrical Engr., 1977
Specialty: Digital Signal Processing and System Theory
Assigned: RADC

Dr. Bruce R. Feiring
Assistant Professor
University of Minnesota
Dept. of Mgmt. Sciences
Minneapolis, MN 55455
(612) 376-1376

Degree: Ph. D., Industrial Engr., 1979
Specialty: Optimization
Assigned: HRL/Brooks

B. List of Participants (continued: page 7)

Dr. William Feld
Associate Professor
Wright State University
Dept. of Chemistry
Dayton, OH 45435
(513) 873-2511

Degree: Ph. D., Chemistry, 1971
Specialty: Organic Chemistry
Assigned: ML

Dr. Dennis Flentge
Assistant Professor
Cedarville College
Dept. of Math/Sci.
Cedarville, OH 45314
(513) 766-2211

Degree: Ph. D., Physical Chemistry, 1974
Specialty: Catalysis, IR Spectroscopy
Assigned: APL

Dr. Cynthia Ford
Assistant Professor
Jackson State University
Psychology Department
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(601) 968-2371

Degree: Ph. D., Educ. Psychology, 1979
Specialty: General Psychology, Statistics
Assigned: HRL/Brooks

Dr. Eddie Fowler
Associate Professor
Kansas State University
Electrical Engr. Dept.
Manhattan, KS 66056
(913) 532-5600

Degree: Ph. D., Elec. Eng., 1969
Specialty: C^3I Modeling and Simulation Nuclear Degradation of Comm. Networks
Assigned: WL

Dr. Basil Gala
Professor
California State University
Division of Engineering
Chico, CA 95929
(916) 895-5374

Degree: Ph. D., Electrical Engr., 1973
Specialty: Computers-Pattern Recognition
Assigned: RADC

Dr. Barry Ganapol
Associate Professor
University of Arizona
Dept. of Nuclear & Energy Engr.
Tucson, AZ 85721
(602) 621-4728

Degree: Ph. D., Nuclear Science, 1971
Specialty: Particle Transport Theory
Assigned: RADC

Dr. David Gilliam
Assistant Professor
Texas Tech. University
Dept. of Mathematics
Lubbock, TX 79409
(806) 742-2566

Degree: Ph. D., Mathematics, 1977
Specialty: Applied Partial Differential Equations
Assigned: RADC

B. List of Participants (continued: page 8)

Dr. Larry Glasgow
Assistant Professor
Kansas State University
Chemical Engr. Dept.
Manhattan, KS 66506
(913) 532-5585

Degree: Ph. D., Chemical Engr., 1977
Specialty: Fluid Mechanics, Transport Phenomena, Laser-Doppler Velocity
Assigned: FJSRL

Dr. Sallie Gordon
Assistant Professor
Wright State University
Dept. of Psychology
Dayton, OH 45435
(513) 873-2391

Degree: Ph. D., Psychology, 1982
Specialty: Social/Cognitive Psychology
Assigned: HRL/Wright-Patterson

Dr. Thomas Graham
Professor
University of Dayton
Physics Dept.
Dayton, OH 45469
(513) 229-2329

Degree: Ph. D., Physics, 1967
Specialty: Solid State/Surface Physics/ Magnetic Resonance
Assigned: ML

Dr. Edward Greco, Jr.
Assistant Professor
University of Miami
Biomedical Engr. Dept.
Coral Gables, FL 33124
(305) 284-2442

Degree: Ph. D., Elec./Bioengr., 1976
Specialty: Digital Signal Processing, Biosystem Analysis and Ventilatory Control
Assigned: SAM

Dr. Ronald Greene
Associate Professor
University of New Orleans
Physics Deptartment
New Orleans, LA 70148
(504) 286-6714

Degree: Ph. D., Physics, 1974
Specialty: Plasma Spectroscopy
Assigned: AL

Dr. Paul Griesacker
Associate Professor
Gannon University
Deptartment of Physics
Erie, PA 16541
(814) 871-7649

Degree: Ph. D., Physics, 1963
Specialty: Physical Optics, Coherent Radiation
Assigned: AL

Dr. Thomas Gulledge, Jr.
Assistant Professor
Louisiana State University
Dept. of Quantitative Bus. Anal.
Baton Rouge, LA 70803
(504) 388-2126

Degree: Ph. D., Eng. Mgmt., 1981
Specialty: Management Science
Assigned: BRMC

B. List of Participants (continued: page 9)

Dr. Vijay Gupta
Associate Professor
Central State University
Chemistry Department
Wilberforce, OH 45384
(513) 376-6423

Degree: Ph. D., Chemistry, 1969
Specialty: Physical Chemistry
Assigned: ML

Dr. Hendrik Hameka
Professor
University of Pennsylvania
Chemistry Dept.
Philadelphia, PA 19104
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Degree: Ph. D., Theoretical Chem., 1956
Specialty: Quantum Chemistry, Theoretical Chemistry
Assigned: FJSRL

Dr. Arthur Harriman
Professor
Oklahoma State University
Dept. of Psychology
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Degree: Ph. D., Exp. Psychology, 1952
Specialty: Physiological Psychology
Assigned: HRL/Williams

Dr. Doyle Hasty
Assistant Professor
Motlow State Community College
Dept. of Engineering
Tullahoma, TN 37388
(615) 455-8511

Degree: M.S., Engineering Admn., 1974
Specialty: Electronics, Physics, Instrumentation, Computers, High-altitude Engine Test.
Assigned: AEDC

Dr. Albert Havener
Assistant Professor
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Dept. of Mechanical Engr.
Dayton, OH 45469
(513) 229-2835

Degree: Ph. D., Aerospace Engr., 1983
Specialty: Applied Aero Optical Measuring Techniques
Assigned: FDL

Dr. Peter Hierl
Professor
Kansas University
Chemistry Department
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(913) 864-3019

Degree: Ph. D., Physical Chemistry 1964
Specialty: Gas-phase Kinetics
Assigned: GL

Dr. Paul Hoffman
Assistant Professor
Villanova University
Dept. of Civil Engineering
Villanova, PA 19085
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Degree: Ph. D., Civil Engineering 1982
Specialty: Structural Eng. and Solid Mechanics
Assigned: ESC

B. List of Participants (continued: page 10)

Dr. Brian Holmes
Assistant Professor
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Dept. of Physics
San Jose, CA 95912
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Degree: Ph. D., Physics, 1980
Specialty: Solid State/Low Temperature; Magnetic Resonance
Assigned: RADC

Dr. Gwendolyn Howze
Associate Professor
Texas Southern University
Dept. of Biology
Houston, TX 77004
(713) 527-7005

Degree: Ph. D., Molecular Biology, 1974
Specialty: Cell Biology/Chromatin, Electron Microscopy, Tissue Cult
Assigned: AMRL

Dr. Chen-Chi Hsu
Professor
University of Florida
Dept. of Engineering Sci.
Gainesville, FL 32611
(904) 392-0961

Degree: Ph. D., Eng. Mech., 1965
Specialty: Applied Mechanics, Computational Aerodynamics
Assigned: AD

Dr. Mario Innocenti
Assistant Professor
Auburn University
Aerospace Engr. Dept.
Auburn, AL 36849
(205) 826-4874

Degree: Ph. D., Aeronautics Astronautics, 1983
Specialty: Flight Dynamics Handling Qualities Optimal Control
Assigned: FDL

Dr. Kakkattukuzhy Isaac
Assistant Professor
University of Missouri
Dept. of Mech. & Aero. Engr.
Rolla, MO 65401
(314) 341-4626

Degree: Ph. D., Aerospace Eng., 1982
Specialty: Fluid Mechanics
Assigned: APL

Dr. Robert Jackson, Jr.
Assistant Professor
University of Massachusetts
Dept. of Elec. & Comp. Engr.
Amherst, MA 01003
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Degree: Ph. D., Elec. Eng., 1982
Specialty: Electromagnetics, Active Devices for Microwave and Millimeter Wave Integrated Circuits
Assigned: RADC

Dr. Vinod Jain
Assistant Professor
University of Dayton
Dept. of Mechanical Engr.
Dayton, OH 45469
(513) 229-2835

Degree: Ph. D., Mech. Eng., 1980
Specialty: Materials and Manufactoring, Design, and Tribiology
Assigned: ML

B. List of Participants (continued: page 11)

Dr. Bruce Janson
Assistant Professor
Carnegie Mellon University
Dept. of Civil Engr.
Pittsburgh, PA 15213
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Degree: Ph. D., Civil Eng., 1981
Specialty: Engineering Planning and Management
Assigned: LMC

Dr. Charles Jones
Associate Professor
North Carolina Central
Dept. of Physics
Durham, NC 27707
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Degree: Ph. D., Physics, 1977
Specialty: Lasers and their Applications, Optics, Electro-Optics
Assigned: AD

Dr. Walter Jones
Assistant Professor
University of Tennessee
Dept. of Engr. Sci. Mech.
Knoxville, TN 37996
(615) 974-7684

Degree: Ph. D., Engr. Mechanics, 1982
Specialty: Mechanical Behavior of Composite Materials
Assigned: FDL

Dr. Robert Kallman
Professor
North Texas State University
Dept. of Mathematics
Denton, TX 76203
(817) 565-2155

Degree: Ph. D., Mathematics, 1968
Specialty: Analysis
Assigned: AD

Dr. William Kane, Jr.
Associate Professor
Western Carolina University
Management Dept.
Cullowhee, NC 28723
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Degree: Ph. D., Organ. Behavior, 1977
Specialty: Organizational Behavior-Strategic Management
Assigned: HRL/Wright-Patterson

Dr. Yong Kim
Instructor
McNeese State University
Civil & Mechanical Engr. Dept.
Lake Charles, LA 70609
(318) 477-2520

Degree: Ph. D., Civil Engineering 1984
Specialty: Geotechnical Engineering
Assigned: ESC

Dr. Ronald Kline
Assistant Professor
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School of Aero. Mech., & Nuc. Eng.
Norman, OK 73019
(405) 325-5011

Degree: Ph. D., Mech, and Material Sci., 1978
Specialty: Nondestructive Testing, Mechanics of Composite Materials
Assigned: ML

B. List of Participants (continued: page 12)

Dr. Kent Knaebel
Assistant Professor
Ohio State University
Chemical Engineering Dept.
Columbus, OH 43210
(614) 422-2508

Degree: Ph. D., Chemical Engr., 1980
Specialty: Adsorption, Ion-exchange, Separations
Assigned: SAM

Dr. David Kohfeld
Professor
Southern Illinois University
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(618) 692-2582

Degree: Ph. D., Exper. Psychology, 1966
Specialty: Methods of Psychological Inquiry
Assigned: HRL/Williams

Dr. Gabriel Kojoian
Associate Professor
University of Wisconsin
Dept. of Physics/Astronomy
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(715) 836-3148

Degree: Ph. D., Physics, 1966
Specialty: Radio Astronomy
Assigned: GL

Dr. Arthur Kovitz
Professor
Northwestern University
Mechanical Engr. Dept.
Evanston, IL 60201
(312) 492-7066

Degree: Ph. D., Aero Eng., 1957
Specialty: Fluid Mechanics
Assigned: WL

Dr. Madakasira Krishna
Associate Professor
South Carolina State College
Dept. of Math. & Comp. Sci.
Orangeburg, SC 29117
(803) 536-7121

Degree: Ph. D., Applied Math., 1974
Specialty: Computational Fluid Dynamics
Assigned: AEDC

Dr. Raj Krishnan
Associate Professor
North Texas State University
Physics Dept.
Denton, TX 76203
(817) 565-3284

Degree: Ph. D., Physics, 1966
Specialty: Nuclear Physics, Solid State Physics
Assigned: SAM

Dr. William Kyros
Associate Professor
University of Lowell
Mechanical Eng. Dept.
Lowell, MA 01854
(617) 452-5000

Degree: Ph. D., Education, 1980
Specialty: Mechanical Behavior of Materials
Assigned: ML

B. List of Participants (continued: page 13)

Dr. David Lai
Professor
University of Vermont
Electrical Engr. & Comp. Sci.
Burlington, VT 05405
(802) 656-3330

Degree: Ph. D., Elec. Eng., 1960
Specialty: Signal Processing, Radar Signal Processing, Image Processing
Assigned: RADC

Dr. Charles Lardent, Jr.
Associate Professor
Auburn University
Dept. of Management
Montgomery, AL 36117
(205) 271-9478

Degree: Ph. D., Organ. Behavior, 1979
Specialty: Leadership, Motivation, and Psychometric Assessment
Assigned: LMDC

Dr. Nabil Lawandy
Assistant Professor
Brown University
Engineering Dept.
Providence, RI 02912
(401) 863-2755

Degree: Ph. D., Chem. Physics, 1980
Specialty: Lasers, Spectroscopy, Lasers Atom Interactions
Assigned: GL

Dr. E. Miller Layton, Jr.
Assoc. Professor
Sterling College
Dept. of Chemistry & Applied Math.
Sterling, KS 67579
(316) 278-2173

Degree: Ph. D., Chem. Physics, 1962
Specialty: Molecular Spectroscopy, Theoretical Molecular Calculations
Assigned: RPL

Dr. Evelyn Leggette
Associate Professor
Jackson State University
Dept. of Elem./Early Child/Reading
Jackson, MS 39217
(601) 968-2186

Degree: Ph. D., Curriculum and Inst., 1976
Specialty: Reading Ed., Dev. Ed., Prog. Dev. and Implementation Curriculum
Assigned: LMC

Dr. Meng Liou
Associate Professor
University of Michigan
Aerospace Engr. Dept.
Ann Arbor, MI 48104
(313) 764-3310

Degree: Ph. D., Aerospace Eng., 1977
Specialty: Computational Fluid Dynamics, Gas Dynamics, Unsteady Flow
Assigned: FDL

Dr. David Lohman
Assistant Professor
University of Iowa
College of Education
Iowa City, IA
(319) 353-5961

Degree: Ph. D., Educ. Psychology, 1979
Specialty: Information Processing Theories of Aptitude for Learning
Assigned: HRL/Brooks

B. List of Participants (continued: page 14)

Dr. Lonnie Ludeman
Professor
New Mexico State University
Dept. of Elect. & Comp. Engr.
Las Cruces, NM 88003
(505) 646-1321

Degree: Ph. D., Elec. Eng., 1968
Specialty: Digital Signal Processing, Statistical Communication Theory
Assigned: RADC

Dr. Larry Ludwick
Professor
Tuskegee Institute
Dept. of Chemistry
Tuskegee Institute, AL 36088
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Degree: Ph. D., Inorganic Chem., 1969
Specialty: Transition Metal Chem., Siloxane Polymers
Assigned: ML

Dr. Robert MacCallum
Associate Professor
Onio State University
Psychology Dept.
Columbus, OH 43210
(614) 422-1030

Degree: Ph. D., Psychology, 1974
Specialty: Quantitive Psychology
Assigned: AMRL

Dr. William McCormick
Associate Professor
Wright State University
Dept. of Electrical Engr.
Dayton, OH 45435
(513) 873-2849

Degree: Ph. D., Electrical Engr. 1967
Specialty: Radar, Communications and Electromagnetics
Assigned: AL

Dr. Odis McDuff
Professor
University of Alabama
Dept. of Electrical Engr.
University, AL 35486
(205) 348-6351

Degree: Ph. D., Electrical Engr., 1966
Specialty: Lasers and Optics, Electromagnetics
Assigned: SAM

Dr. Bernard McIntyre
Associate Professor
University of Houston
Electronics Dept.
Houston, TX 77004
(713) 749-4753

Degree: Ph. D., Solid State Physics, 1970
Specialty: Diamagnetism in Metals
Assigned: GL

Dr. Richard Miers
Associate Professor
Indiana University
Department of Physics
Fort Wayne, IN 46805
(219) 482-5693

Degree: Ph. D., Atomic Physics, 1970
Specialty: Atom Physics
Assigned: APL

B. List of Participants (continued: page 15)

Dr. John Minor
Assistant Professor
University of Oklahoma
Elect. Engr. & Comp. Sci. Dept.
Norman, OK 73069
(405) 325-4721

Degree: Ph. D., Computer Science, 1979
Specialty: Artifical Intelligence
Assigned: RADC

Dr. Charles Mitchell
Professor
Colorado State University
Dept. of Mechanical Engr.
Fort Collins, CO 80523
(303) 491-6558

Degree: Ph. D., Aerospace and Mechanical Science, 1967
Specialty: Combustion Instability, Combustion, Gas Dynamics
Assigned: RPL

Dr. Don Mittleman
Professor
Oberlin College
Dept. of Mathematics
Oberlin, OH 44074
(216) 775-8385

Degree: Ph. D., Mathematics, 1951
Specialty: Geometry, Analysis, Mech.
Assigned: FDL

Dr. Dale Moses
Associate Professor
San Diego State University
Aerospace & Mechan. Engr. Dept.
San Diego, CA 92182
(619) 265-5764

Degree: Ph. D., Aerospace Engr., 1981
Specialty: Wind Tunnel Testing, Aerodynamics
Assigned: FDL

Dr. Kevin Mossholder
Associate Professor
Auburn University
Management Department
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Degree: Ph. D., Ind./Organ. Psychology, 1978
Specialty: I/O Topics: Organizational Behavior, Human Resources Mgmt.
Assigned: LMDC

Dr. James Mrotek
Associate Professor
Meharry Medical College
Dept. of Physiology
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Degree: Ph. D., Biology, 1973
Specialty: Endocrine Cell Intracellular Exchanges
Assigned: SAM

Dr. Richard Murphy
Professor
University of Missouri
Department of Physics
Kansas City, MO 64110
(816) 276-1604

Degree: Ph. D., Physics, 1968
Specialty: Statistical Mechanics; Theory of Liquids and Solids
Assigned: FJSRL

B. List of Participants (continued: page 16)

Dr. Lena Myers
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Jackson State University
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Degree: Ph. D., Sociology, 1973
Specialty: Social Psychology
Assigned: SAM

Dr. Datta Naik
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Degree: Ph. D., Chemistry, 1972
Specialty: Analytical/Inorganic Chemistry
Assigned: ESC

Dr. Stephan Nix
Assistant Professor
Syracuse University
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Syracuse, NY 13210
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Degree: Ph. D., Environmental Eng., 1982
Specialty: Environmental Resources Mgmt., Operations Rsch., Economics, Hydrology
Assigned: OEHL

Dr. William Norton
Associate Professor
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Biology Department
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Degree: Ph. D., Cell Biology, 1975
Specialty: Cytopathology, Cellular Ultrastructure
Assigned: AMRL

Dr. Kendall Nygard
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Dept. of Mathematical Sci.
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Degree: Ph. D., Oper. Rsch., 1978
Specialty: Optimization, Simulation Modeling, Computer Graphics
Assigned: LC

Dr. Robert O'Connell
Assistant Professor
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Columbia, MO 65211
(314) 882-8373

Degree: Ph. D., Elec. Eng., 1975
Specialty: Physical and Quantum Electronics, and Applied Optics
Assigned: FJSRL

Dr. William Pardo
Associate Professor
University of Miami
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Degree: Ph. D., Physics, 1957
Specialty: Experimental Plasma Physics
Assigned: AD

B. List of Participants (continued: page 17)

Dr. Martin Patt
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Degree: M.S., Electrical Engr., 1964
Specialty: Computer Science
Assigned: GL

Dr. James Patterson
Professor
S.D. School of Mines/Tech.
Physics Dept.
Rapid City, SD 57701
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Degree: Ph. D., Physics, 1962
Specialty: Theoretical Solid State Physics
Assigned: AL

Dr. M. Carr Payne, Jr.
Professor
Georgia Inst. of Tech.
Dept. of Psychology
Atlanta, GA 30332
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Degree: Ph. D., Psychology, 1951
Specialty: Experimental Psychology, Psychoacoustics, Eng. Psy.
Assigned: AEDC

Dr. William Perrizo
Associate Professor
North Dakota State University
Dept. of Computer Science
Fargo, ND 58105
(701) 237-7248

Degree: Ph. D., Dynamical Systems, 1972
Specialty: Distributed Database Systems
Assigned: ESD

Dr. Boake Plessy
Professor
Dillard University
Chemistry Department
New Orleans, LA 70122
(504) 283-8822

Degree: Ph. D., Physical Chem., 1974
Specialty: Polymers and Biopolymers, Analytical Chemistry
Assigned: SAM

Dr. Kuldip Rattan
Associate Professor
Wright State University
Dept. of Systems Eng.
Dayton, OH 45435
(513) 873-2403

Degree: Ph. D., Electrical Engr., 1975
Specialty: Digital Control Systems
Assigned: FDL

Dr. Hemen Ray
Assistant Professor
N. C. Argic. & Tech. St. Univ.
Dept. of Mechanical Engr.
Greensboro, NC 27411
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Degree: Ph. D., Eng. Mech., 1979
Specialty: Advanced Composites
Assigned: FDL

B. List of Participants (continued: page 18)

Dr. Larry Reeker
Professor
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Computer Science Dept.
New Orleans, LA 70118
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Degree: Ph. D., Comp. Sci., 1974
Specialty: Computational Linguistics, Programming Languages, Computer-aided
Assigned: HRL/Lowry

Dr. David Reynolds
Assistant Professor
Wright State University
Dept. of Engineering
Dayton, OH 45435
(513) 873-2403

Degree: Ph. D., Biomedical Eng., 1978
Specialty: Pulmonary Mechanics, Biofluid Mechanics
Assigned: AMRL

Dr. Joseph Saliba
Assistant Professor
University of Dayton
Civil Engr. Dept.
Dayton, OH 45469
(513) 299-3847

Degree: Ph. D., Solid Mechanics, 1983
Specialty: Structures
Assigned: AMRL

Dr. Walter Salters
Associate Professor
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Dept. of Natural Science
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Degree: Ph. D., Cell Biology, 1976
Specialty: Cell and Molecular Biology
Assigned: SAM

Dr. Lowell Schipper
Professor
Bowling Green State University
Dept. of Psychology
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Degree: Ph. D., Psychology, 1953
Specialty: Statistics, Measurement
Assigned: HRL/Williams

Dr. Robert Schlegel
Assistant Professor
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Dept. of Industrial Engr.
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Degree: Ph. D., Ind. Eng., 1980
Specialty: Human Factors Engineering/ Ergonomics
Assigned: AMRL

Dr. Howard Schleier
Department Chairman
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Degree: M.S., Chem. Eng., 1962
Specialty: Fluid Mechanics, Heat and Mass Transfer, Thermodynamics
Assigned: RPL

B. List of Participants (continued: page 19)

Dr. James Schneider
Professor
University of Dayton
Physics Department
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(513) 229-2727

Degree: Ph. D., Physics, 1965
Specialty: Solid State Physics
Assigned: ML

Dr. Gordon Schrank
Associate Professor
St. Cloud State University
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Degree: Ph. D., Med. Microbiology, 1974
Specialty: Electron Microscopy
Assigned: SAM

Dr. Keith Seitter
Assistant Professor
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Degree: Ph. D., Geophysical Sci., 1982
Specialty: Dynamic Meteorology
Assigned: GL

Dr. Paavo Sepri
Associate Professor
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Nuclear Engr. Dept.
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Degree: Ph. D., Engr. Science 1971
Specialty: Fluid Mechanics and Heat Transfer
Assigned: APL

Dr. Robert Shaw
Professor
University of Connecticut
Dept. of Psychology
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Degree: Ph. D., Psychology, 1965
Specialty: Perception/Cognition/Math. Models/Growth Simulation Models
Assigned: AMRL

Dr. John Sheldon
Professor
Florida International Univ.
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Degree: Ph. D., Engineering, 1964
Specialty: Chemical Kinetics
Assigned: AD

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Pullman, WA 99164
(509) 335-5183

Degree: Ph. D., Engineering Mech., 1966
Specialty: Structural Mechanics
Assigned: WL

B. List of Participants (continued: page 20)

Dr. Charles Spiteri
Assistant Professor
Queensborough Community College
Dept. of Elect. & Comp. Tech.
Bayside, NY 11364
(212) 631-6207

Degree: M.E.E., Elec. Eng., 1980
Specialty: Computer Communications, Local Networks
Assigned: ESD

Dr. William Squires
Associate Professor
Texas Lutheran College
Dept. of Biology
Seguin, TX 78155
(512) 379-4161

Degree: Ph. D., Exercise Physiology, 1979
Specialty: Biology, Physiology
Assigned: SAM

Dr. Arthur Sterling
Professor
Louisiana State University
Dept. of Chemical Engr.
Baton Rouge, LA 70803
(504) 388-1426

Degree: Ph. D., Chemical Engr., 1969
Specialty: Fluid Mechanics, Heat Transfer
Assigned: ESC

Dr. Alexander Stone
Professor
University of New Mexico
Mathematics Dept.
Albuquerque, NM 87131
(505) 277-4613

Degree: Ph. D., Mathematics, 1965
Specialty: Differential Geometry, Differential Equations, Electromagnetism
Assigned: SAM

Dr. William Stone
Assistant Professor
Meharry Medical College
Division of Biomedical Sci.
Nashville, TN 37208
(615) 327-6506

Degree: Ph. D., Molecular and Cellular Biology, 1972
Specialty: Retinal Biochemistry and Lipid Peroxidation
Assigned: WL

Dr. Jimmy Street
Associate Professor
University of Florida
Soil Science Dept.
Gainesville, FL 32611
(904) 392-1951

Degree: Ph. D., Soil Chem., 1976
Specialty: Soil Pollution
Assigned: ESC

Dr. John Swetits
Professor
Old Dominion University
Mathematics Department
Norfolk, VA 23508
(804) 440-3911

Degree: Ph. D., Mathematics, 1968
Specialty: Approximation Theory and Numerical Analysis
Assigned: AL

B. List of Participants (continued: page 21)

Dr. Richard Tankin
Professor
Northwestern University
Mech. & Nuclear Engr. Dept.
Evanston, IL 60201
(312) 492-3532

Degree: Ph. D., Mech. Engineering, 1960
Specialty: Fluid Mechanics, Heat Transfer
Assigned: APL

Dr. William Thomas
Assistant Professor
Meharry Medical College
Physiology Dept.
Nasnville, TN 37208
(615) 327-6979

Degree: Ph. D., Biochemistry, 1980
Specialty: Neurochemistry
Specialty: SAM

Dr. Ken Tomiyama
Assistant Professor
Pennsylvania State University
Dept. of Electrical Eng.
University Park, PA 16802
(814) 865-7667

Degree: Ph. D., System Science, 1977
Specialty: Appl. of System Science in Various Fields
Assigned: GL

Dr. Albert Tong
Assistant Professor
University of Texas
Dept. of Mechanical Engr.
Arlington, TX 76019
(817) 273-2297

Degree: Ph. D., Mechanical Engr., 1983
Specialty: Thermoscience
Assigned: APL

Dr. Robert Vance
Assistant Professor
Ohio State University
Psychology Department
Columbus, OH 43210
(614) 422-0685

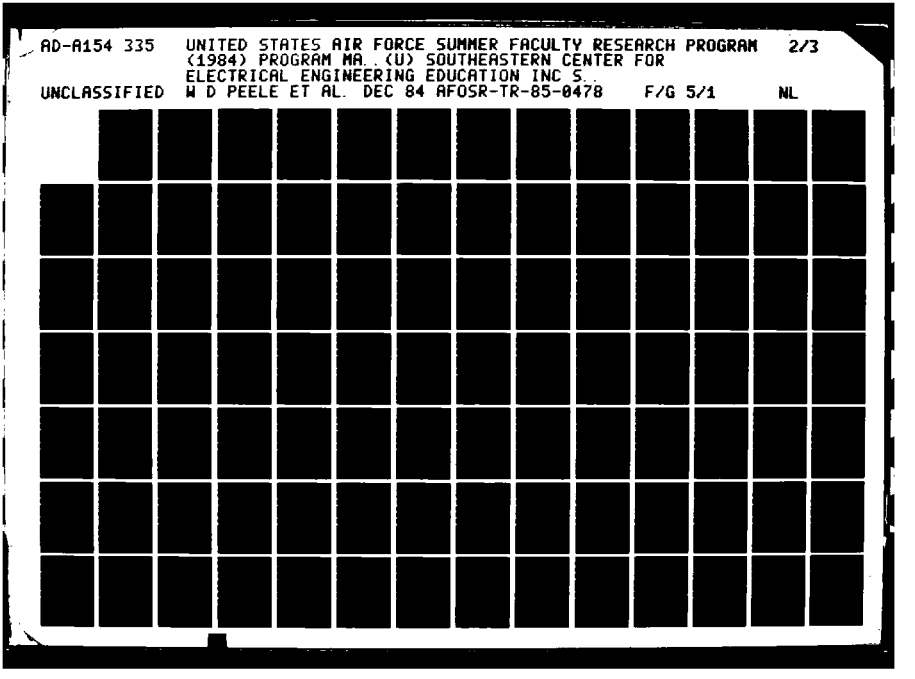
Degree: Ph. D., Ind./Organ. Psy., 1981
Specialty: Personnel Psychology, Organizational Behavior
Assigned: HRL/Brooks

Dr. Brian Vick
Assistant Professor
Va. Polytechnic Inst. & St. Univ.
Mech. Engr. Dept.
Blacksburg, VA 24061
(703) 961-7596

Degree: Ph. D., Mechanical Engr., 1981
Specialty: Heat Transfer
Assigned: RPL

Dr. Stephen Wallace
Assistant Professor
University of Colorado
Inst. of Cognitive Science
Boulder, CO 80309
(303) 492-8086

Degree: Ph. D., Human Motor Behavior, 1976
Specialty: Human Motor Behavior
Assigned: HRL/Lowry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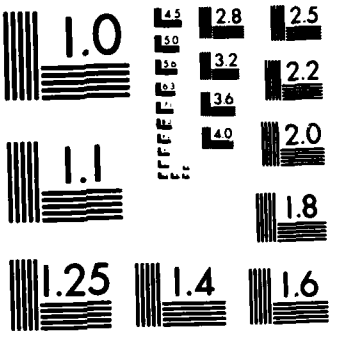


B. List of Participants (continued: page 22)

Dr. Yin-min Wei
Professor
Ohio State University
Computer Science Dept.
Athen, OH 45701
(614) 594-6574

Degree: Ph. D., Electrical Engr., 1966
Specialty: Signal Processing
Assigned: AMRL

Dr. Isaac Weiss
Assistant Professor
Wright State University
Deptartment of Engineering
Dayton, OH 45435
(513) 873-3021

Degree: Ph. D., Metallurgy, 1978
Specialty: Thermomechanical Processing, Deformation Processing
Assigned: ML

Martin Werner
Assistant Professor
University of Texas
School of Public Health
San Antonio, TX 78284
(512) 691-6845

Degree: Ph. D., Environmental Engr., 1982
Specialty: Hazardous Waste Mgmt. Engineering TmT
Assigned: ESC

Dr. John Wilson
Associate Professor
South Carolina State College
Habilitative Science Dept.
Orangeburg, SC 29117
(803) 536-8179

Degree: Ph. D., Speech Science/ Communications, 1979
Specialty: Acoustic and Experimental Phonetics
Assigned: RADC

Dr. Krystine Yaworsky
Associate Professor
Le Moyne College
Psychology Department
Syracuse, NY 13214
(315) 446-2882

Degree: Ph. D., Cognitive Psychology, 1977
Specialty: Cognitive Processes in Perception, Human Learning and Memory
Assigned: HRL/Wright-Patterson

Dr. Chyang Yu
Assistant Professor
Wilkes College
Dept. of Materials Engr.
Wilkes-Barre, PA 18766
(717) 824-4651

Degree: Ph. D., Ceramic Eng., 1977
Specialty: Structural Ceramic Materials, Electronic Ceramics, Microanalysis
Assigned: ML

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 1)

1984 USAF/SCEEE SUMMER FACULTY RESEARCH PROGRAM

AERO PROPULSION LABORATORY
(Wright-Patterson Air Force Base)

1. Richard Anderson
2. Huei-huang Chiu
3. Louis Chow
4. John Erdei
5. Dennis Flentge
6. Kakkattukuzhy Isaac
7. Richard Miers
8. Paavo Sepri
9. Richard Tankin
10. Albert Tong

AEROSPACE MEDICAL RESEARCH LABORATORY
(Wright-Patterson Air Force Base)

1. Gwendolyn Howze
2. Robert MacCallum
3. William Norton
4. David Reynolds
5. Joseph Saliba
6. Robert Schlegel
7. Robert Shaw
8. Yin-Min Wei

ARMAMENT DIVISION
(Eglin Air Force Base)

1. Myron Calhoun
2. Do Chang
3. Robert Courter
4. Terrence Dwan
5. Chen-Chi Hsu
6. Charles Jones
7. Robert Kallman
8. William Pardo
9. John Sheldon

ARNOLD ENGINEERING DEVELOPMENT CENTER
(Arnold Air Force Station)

1. Gregory Corso
2. Doyle Hasty
3. Madakasira Krishna
4. M. Carr Payne, Jr.

AVIONICS LABORATORY
(Wright-Patterson Air Force Base)

1. Albert Biggs
2. Mike Burlakoff
3. Ronald Greene
4. Paul Griesacker
5. William McCormick
6. James Patterson
7. John Swetits

BUSINESS RESEARCH MANAGEMENT CENTER
(Wright-Patterson Air Force Base)

1. Richard Bernhard
2. Thomas Gulledge, Jr.

ELECTRONICS SYSTEMS DIVISION
(Hanscom Air Force Base)
1. William Perrizo
2. Charles Spiteri

ENGINEERING & SERVICES CENTER
(Tyndall Air Force Base)
1. Annalingam Anandarajah
2. Eric Drumm
3. Paul Hoffman
4. Yong Kim
5. Datta Naik
6. Arthur Sterling
7. Jimmy Street
8. Martin Werner

FLIGHT DYNAMICS LABORATORY
(Wright-Patterson Air Force Base)
1. George Doyle
2. Franklin Eastep
3. Albert Havener
4. Mario Innocenti
5. Walter Jones
6. Meng Liou
7. Don Mittleman
8. Dale Moses
9. Kuldip Rattan
10. Hemen Ray

FRANK J. SEILER RESEARCH LABORATORY
(USAF Academy)
1. David Chung
2. Hermann Donnert
3. James Eberhart
4. Larry Glasgow
5. Hendrik Hameka
6. Richard Murphy
7. Robert O'Connell

GEOPHYSICS LABORATORY
(Hanscom Air Force Base)
1. Francesco Bacchialoni
2. John Bahng
3. James Baird
4. Alan Bentley
5. Frank Colby
6. John Cyranski
7. Peter Hierl
8. Gabriel Kojoian
9. Nabil Lawandy
10. Bernard McIntyre
11. Martin Patt
12. Keith Seitter
13. Ken Tomiyama

HUMAN RESOURCES LABORATORY/LRL
(Wright-Patterson Air Force Base)
1. Subramaniam Deivanayagam
2. Emory Enscore, Jr.
3. Sallie Gordon
4. William Kane, Jr.
5. Krystine Yaworsky

HUMAN RESOURCES LABORATORY/OTR
(Williams Air Force Base)
1. Arthur Harriman
2. David Kohfeld
3. Lowell Schipper

C. PARTICIPANT LABORATORY ASSIGNMENTS (Continued: page 3)

HUMAN RESOURCES LABORATORY/MO
(Brooks Air Force Base)
1. Bruce Feiring
2. Cynthia Ford
3. David Lohman
4. Robert Vance

HUMAN RESOURCES LABORATORY/ID
(Lowry Air Force Base)
1. Larry Reeker
2. Stephen Wallace

LEADERSHIP & MANAGEMENT DEVELOPMENT CENTER
(Maxwell Air Force Base)
1. Louis Buckalew
2. Charles Lardent
3. Kevin Mossholder

LOGISTICS COMMAND
(Wright-Patterson Air Force Base)
1. Kendall Nygard

LOGISTICS MANAGEMENT CENTER
(Gunter Air Force Base)
1. Philip Chong
2. Bruce Janson
3. Evelyn Leggette

MATERIALS LABORATORY
(Wright-Patterson Air Force Base)
1. Charles Drummond, III
2. Delcie Durham
3. William Feld
4. Thomas Graham
5. Vijay Gupta
6. Vinod Jain
7. Ronald Kline
8. William Kyros
9. Larry Ludwick
10. James Schneider
11. Isaac Weiss
12. Chyang Yu

OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY
(Brooks Air Force Base)
1. Stephan Nix

ROCKET PROPULSION LABORATORY
(Edwards Air Force Base)
1. Gloria Anderson
2. E. Miller Layton, Jr.
3. Charles Mitchell
4. Howard Schleier
5. Brian Vick

C. PARTICIPANT LABORATORY ASSIGNMENT (Continued: page 4)

ROME AIR DEVELOPMENT CENTER
(Griffiss Air Force Base)

1. Adly Fam
2. Basil Gala
3. Barry Ganapol
4. David Gilliam
5. Brian Holmes
6. Robert Jackson, Jr.
7. David Lai
8. Lonnie Ludeman
9. Jonn Minor
10. Johnny Wilson

SCHOOL OF AEROSPACE MEDICINE
(Brooks Air Force Base)

1. Deborah Armstrong
2. Mukul Banerjee
3. Jeya Chandra
4. David Cohoon
5. Robert Dorman
6. Edward Greco, Jr.
7. Kent Knaebel
8. Raj Krishnan
9. Odis McDuff
10. James Mrotek
11. Lena Myers
12. Boake Plessy
13. Walter Salters
14. Gordon Schrank
15. William Squires
16. William Stone
17. William Thomas

WEAPONS LABORATORY
(Kirtland Air Force Base)

1. Robert Colclaser, Jr.
2. Frederick Eisler
3. Eddie Fowler
4. Arthur Kovitz
5. Harold Sorensen
6. Alexander Stone

APPENDIX III

A. Listing of Research Reports Submitted in the 1984 Summer Faculty Research Program

B. Abstracts of the 1984 Associates' Research Reports

RESEARCH REPORTS
1984 USAF-SCEEE SUMMER FACULTY RESEARCH PROGRAM

Volume I Report Number	Title	Research Associate
1	Centrifuge Modeling of Structural Response During Underground Explosions- a Preliminary Theoretical Feasibility Study	Dr. A. Anandarajah
2	New Synthetic Techniques for Advanced Propellant Ingredients: Selective Chemical Transformations and New Structures - Bis-Fluorodinitroethylamino Derivatives	Dr. Gloria L. Anderson
3	Infrared Absorption Spectra of Silane and Disilane	Dr. Richard Anderson
4	The Characterization of ^{14}C-Serotonin Uptake into Cerebellar Glomeruli	Dr. Deborah L. Armstrong
5	Automatic Controller for Space Experiments	Dr. Francesco L. Bacchialoni
6	Two-Color Refractometry for Astronomical Geodesy	Dr. John D. R. Bahng
7	Long Wavelength infrared Emissions from a Recombining Oxygen Plasma	Dr. James C. Baird
8	Development of a High Frequency Lung Ventilation Model for Testing Under Hypobaric Conditions	Dr. Mukul R. Banerjee
9	Astronomical Observations Using the Imaging Camera of the Large Aperture Infrared Telescope System	Dr. Alan F. Bentley
10	Some Recommendations for Improvements in the Theory and Practice of DoD Incentive Contracting	Dr. Richard H. Bernhard
11	Simulation of Radar Reception from Terrain and Airborne Targets	Dr. Albert W. Biggs

Report Number	Title	Research Associate
12	USAF Spouse Survey: Theoretical Model, Critique, and Revision	Dr. L.W. Buckalew
13	Ada Compiler Evaluation and Validation (E&V) Taxonomy	Mike Burlakoff
14	Software Drivers for the Z-204 Multiport Interface Card	Dr. Myron A. Calhoun
15	The Analysis of a Single Base in an Airlift Operation	Dr. M. Jeya Chandra
16	The Roles of PEI as an Additive in EAK	Dr. Do Ren Chang
17	The Uniqueness of Phase Retrieval from Intensity Measurements	Dr. Huei-huang Chiu
18	Investigating the Potential Application of an "Integrated" Resource Management System to Various Air Force Environments	Dr. Philip S. Chong
19	Low Temperature Expandable Mega-Watt Pulse Power Radiator	Dr. Louis C. Chow
20	Experimental Evaluation and Development of Components for an Infrared Passive Laser Gyro	Dr. David Y. Chung
21	The Electromagnetic Pulse Response of Structures with Frequency Dependent Electrical Properties	Dr. David K. Cohoon
22	Comparison Between Two Atmospheric Boundary Layer Models: Second-Order Turbulence Closure Versus Highly Parameterized, Simplified Physics	Dr. Frank P. Colby, Jr.
23	A Study of the Shiva Star-Type Inductive Pulse Compression System	Dr. R. Gerald Colclaser
24	An Identification of the Human Limitations in the Control Room of Wind Tunnel 4T	Dr. Gregory M. Corso
25	Internal Flow Studies of a Class of Ballistic Launchers	Dr. Robert W. Courter

Report Number	Title	Research Associate
26	Dynamical Spectral Analysis for Nonstationary processes	Dr. John F. Cyranski
27	An Experimental Investigation of Human Torque Strength	Dr. S. Deivanayagam
28	Effects of Nuclear Radiation on the Optical Characteristics of Laser Components	Dr. Hermann J. Donnert
29	Phospholipid Metabolism in a Synaptic Membrane Preparation Isolated from Cerebellar Cortex	Dr. Robert V. Dorman
30	A Review of Computer Simulations for Aircraft-Surface Dynamics	Dr. George R. Doyle, Jr.
31	Constitutive Modelling for Blast Induced Wave Propagation	Dr. E. C. Drumm
32	SiC Reinforced Glass-Ceramic Composites	Dr. Charles H. Drummond
33	Computer Simulation of TI-6AL-4V and Rene' 95 Disks for the T-700 Engine	Dr. Delcie R. Durham
34	Graphics Generation and Image Enhancement and Restoration Techniques	Dr. Terrence E. Dwan
35	Structural Modifications to Enhance the Active Vibration Control of Large Flexible Structures	Dr. Franklin E. Eastep
36	Wetting Behavior of Imidazolium-Containing Room-Temperature Molten Salts	Dr. James G. Eberhart
37	The Emittance of Particle and Laser Beams and Measurement of the Angle Between Crossed Laser and Particle Beams to High Precision	Dr. Frederick R. Eisler
38	A Generic Logistics Model for Evaluating Operational Readiness of a Weapon System	Dr. E. Emory Enscore, Jr.

Report Number	Title	Research Associate
39	Characterization of Turbulence Through Methods of Field Theory	Dr. John E. Erdei
40	Issues in High Throughput Signal Processing	Dr. Adly T. Fam
41	Upgrade of Policy Specifying	Dr. Bruce Feiring
42	New Phenoxy Substituted Dianhydrides	Dr. William A. Feld
43	Cyclic Voltammetric and Cobra Analysis of Synthetic Lubricant Degradation	Dr. Dennis R. Flentge
44	Gender Differences on Subtests of the ASVAB and the Relationship Between ASVAB Subtest Scores and Psychological/Social Variables for Males and Females	Dr. Cynthia A. Ford
45	Communications Network Simulation Topics	Dr. Eddie R. Fowler
46	Nonparametric CFAR Detection of MTI Radar Signals in Heavy Clutter	Dr. Basil E. Gala
47	Benchmark Solutions for the Spencer-Lewis Equation Describing Electron Transport in an Infinite Medium	Dr. Barry D. Ganapol
48	Electromagnetic Waves in a Disturbed Atmosphere Environment	Dr. David S. Gilliam
49	Alternative Computational Methods for Separated Flows on Pitched Airfoils	Dr. Larry A. Glasgow
Volume II		
50	Manual and Computer-Aided Sequential Diagnostic Inference	Dr. Sallie E. Gordon
51	Angle Resolved Ion-Scattering Spectroscopy-a Feasibility Study	Dr. Thomas P. Graham
52	Electrogastrogram and its Effectiveness in Evaluation of Motion Sickness	Dr. Edward C. Greco, Jr.

Report Number	Title	Research Associate
53	Far-Infrared Absorption Profiles for Shallow Donors in GaAs-GaAlAs Quantum Well Structures	Dr. Ronald L. Greene
54	Digital Signal Processing Approaches for Analysis and Evaluation of Communication Systems	Dr. Paul B. Griesacker
55	Production Rate Variations Cost Models	Dr. Thomas R. Gulledge, Jr.
56	Thermal Stability Characteristics of Silahydrocarbons	Dr. Vijay K. Gupta
57	Calculations of Electron Spin Resonance Coupling Constants	Dr. Hendrik F. Hameka
58	Effects of Pyridostigmine on Performance of Mission-ready Pilots in the OT Simulation Facility	Dr. Arthur E. Harriman
59	Propulsion Facility Planning for Test Information Productivity Improvement with Emphasis on Data Measurement Uncertainty in the Engine Test Facility	Dr. Doyle E. Hasty
60	A Study on Point Diffraction Interferometry Plus Holographic Measurements of a Turbulent Boundary Layer on a Roughened Wind Tunnel Wall	Dr. A. George Havener
61	Effects of Temperature and Reactant Solvation Upon the Rates of Gas-Phase Ion-Molecule Reactions	Dr. Peter M. Hierl
62	A Monte Carlo Sampling of BDR Times	Dr. Paul C. Hoffman
63	Bismuth Silicon Oxide: Sample Variability Investigated with Thermally Stimulated Conductivity and Thermoluminescence	Dr. Brian W. Holmes

Report Number	Title	Research Associate
64	Comparison of Periosteums from Femur and Vertebral Bone	Dr. Gwendolyn B. Howze
65	On a Thin-Layer Navier-Stokes Code and Transonic Projectile Aerodynamics	Dr. Chen-Chi Hsu
66	Effect of Display Dynamics in Manual Control Tasks	Dr. Mario Innocenti
67	Computational Study of Ramjet Compustor Flowfields	Dr. Kakkattukuzhy M. Isaac
68	Numerical Characterization of Microstrip Discontinuities on Thick Substrates	Dr. Robert W. Jackson, Jr.
69	Advanced Physical Modeling/ Wedge Test Development	Dr. Vinod K. Jain
70	Development of a Vehicle Fleet Analysis System	Dr. Bruce N. Janson
71	Photographic Emulsions for Preparation of Holographic Filters	Dr. Charles R. Jones
72	Fracture Behavior of Cross-Ply Graphite/Epoxy Composite Laminates	Dr. Walter F. Jones
73	The Optimal Construction of Synthetic Discriminant Functions for Optical Matched Filters	Robert R. Kallman
74	Stress and Aircraft Maintenance Performance in a Combat Environment	Dr. William D. Kane, Jr.
75	Finite Element Analysis of Certrifuged Concrete Culverts	Dr. Yong S. Kim
76	Acoustic Emission in Composites	Dr. Ronald A. Kline
77	Process Configuration Alternatives for Separation of Gas Mixtures by Pressure Swing Adsorption	Dr. Kent S. Knaebel
78	The Distributional Analysis of Contrast Sensitivity Measures	Dr. David L. Kohfeld

Report Number	Title	Research Associate
79	The Relation Between Hard X-Ray Bursts and Type II Radio Emission	Dr. Gabriel Kojoian
80	Thermal Layer Development with Energy Flux at the Ground/Air Interface	Dr. Arthur A. Kovitz
81	Computational Fluid Dynamics Grids-Flow Properties Interpretation Algorithm	Dr. Madakasira G. Krishna
82	Development of an Optical Multichannel Analyzer System	Dr. Raj. M. Krishnan
83	Interlaminar Shear Testing of Carbon/Carbon Composites	Dr. William Kyros
84	Two-Dimensional Median for Image Preprocessing in Machine Recognition	Dr. David C. Lai
85	Psychological Correlates of Physiological Indicators of Stress-Related Disorders: A Search for Structure and Relatedness	Dr. Charles L. Lardent, Jr.
86	Optical Bistability with Liquid Media: Experimental Studies and Theoretical Predictions	Dr. N.M. Lawandy
87	Survey of High-Energy Molecular Systems	Dr. E. Miller Layton, Jr.
88	Rewrite of AFM 28-345	Dr. Evelyn J. Leggette
89	Numerical Simulation of a Supersonic Inlet Flow	Dr. Meng-Sing Liou
90	Information Processing Analysis of Spatial Synthesis and of the Relationship Between Learning and Intelligence	Dr. David F. Lohman
91	Suboptimum Extrapolation for Spectral Estimation	Dr. Lonnie C. Ludeman

Report Number	Title	Research Associate
92	Silane-Treated Silica Fillers for Elastomer Reinforcement	Dr. Larry M. Ludwick
93	The Application of Structural Equation Modeling to Experimental Data	Dr. Robert MacCallum
94	The use of the Instantaneous Frequency Transient in the Design and Optimization of the Channelized Receiver and Instantaneous Frequency Measurement (IFM) Versions of the Passive EW Receiver	Dr. William S. McCormick
95	Techniques for Ultra-Short Pulses in Nd:YAG Lasers	Dr. Odis P. McDuff
96	Plasma Generation and Diagnostics for Ionospheric Plasma Simulation	Dr. Bernard McIntyre
97	Spectroscopic Studies of Thyratron Discharges	Dr. Richard E. Miers
98	On Interfacing Logic Programming Systems and Relational Databases	Dr. John T. Minor
Volume III		
99	Evaluation of Models for Liquid Propellant Rocket Combustion Instability	Dr. Charles E. Mitchell
100	Large Space Structure Dynamic Testing	Dr. Don Mittleman
101	Acquisition of Wind Tunnel Wall Pressure Distributions for use in Developing A 3-D Transonic Wall Correction Code	Dr. Dale F. Moses
102	Leadership Effects as Measured by the Organizational Assessment Package: A Multi-level Perspective	Dr. Kevin W. Mossholder
103	Raman Spectroscopy of Unstimulated and Stimulated Cultured Normal and Neoplastic Human or Mammalian Cells	Dr. James J. Mrotek

Report Number	Title	Research Associate
104	Preliminary Monte Carlo Studies of the Structure of Molten Salts	Dr. R. D. Murphy
105	Military Family Stress	Dr. Lena Wright Myers
106	Air Oxidation of Hydrazine - A Kinetic Study	Dr. Datta V. Naik
107	Conceptual Design of the USAF Installation Restoration Program Information Management System	Dr. Stephan J. Nix
108	The Cytotoxic Effects of Trimethylpentane on Rat Renal Tissue	Dr. William N. Norton
109	Computer-Based Optimization Algorithms for LOGAIR Cargo Allocation	Dr. Kendall E. Nygard
110	Laser Damage Studies in Purified and Plasticized Polyakylmethacrylates	Dr. Robert M. O'Connell
111	Experimental Physics Aspects of the AFATL Railgun Effort	Dr. William B. Pardo
112	Analysis of the Validity of Barnes Transmissometer Data	Dr. Martin A. Patt
113	Permanent Periodic Magnets and the Reproducibility of Traveling Wave Tubes	Dr. James D. Patterson
114	Operator Activities in Wind Tunnel 4T	Dr. M. Carr Payne, Jr.
115	Future Tactical Air Control System Database Design	Dr. William Perrizo
116	Raman Spectroscopy of Glycosaminoglycans from Bovine Cornea	Dr. Boake L. Plessy
117	Study of Control Mixer Concept for Reconfigurable Flight Control System	Dr. Kuldip S. Rattan

Report Number	Title	Research Associate
118	Analyslis of Armor Bracketry	Dr. Hemen Ray
119	Artificial Intelligence and Computational Linguistics Research	Dr. Larry H. Reeker
120	Mathematical Modeling of the Human Cardiopulmonary System	Dr. David B. Reynolds
121	Nonlinear Modeling of Seat Cushions	Dr. Joseph E. Saliba
122	The Relationship of Fibrinogen and Plasma Lipids to Bubble Formation at the Air Interface During Decompression Sickness	Dr. Walter L. Salters
123	N/A	Dr. Lowell Schipper
124	Evaluation of Training Performance for the USAF Criterion Task Set	Dr. Robert E. Schlegel
125	Regenerative Heat Transfer in an LSSCDS Engine	Dr. Howard Schleier
126	Raman Spectroscopy Studies of Extrinsic P-Type Silicon	Dr. James Schneider
127	Bacteriologic Techniques for the Isolation and Identification of Legionellae	Dr. Gordon D. Schrank
128	A Three-Dimensional Radiation Boundary Condition for Mesoscale Numerical Models	Dr. Keith L. Seitter
129	Calculation of Enhanced Heating in Turbulent Boundary Layers Influenced by Free Stream Turbulence	Dr. Paavo Sepri
130	An Adjoint Systems Approach to Learning and Transfer of Training	Dr. Robert E. Shaw
131	The Theory of Self-Heating Phenomena in Explosives with Applications to EAK	Dr. John W. Sheldon

Report Number	Title	Research Associate
132	The Development of Computational Efficiencies in Continuum Finite Element Codes using Matrix Difference Equations	Dr. Harold Sorensen
133	Base Communications Architecture Security Issues	Dr. Charles J. Spiteri
134	Cardiovascular Responses of High- and Low-Fit Men to Head-Down Rest Followed by Orthostasis and Exercise	Dr. William Squires
135	Recommendations on Combustion Research at Tyndall Air Force Base, Florida	Dr. Arthur M. Sterling
136	Electromagnetic Lens Design Techniques	Dr. Alexander P. Stone
137	The Role of Antioxidant Nutrients in Preventing Hyperbaric Oxygen Damage to the Retina	Dr. William L. Stone
138	Naphthalene Adsorption by Florida Soils	Dr. Jimmy J. Street
139	An Optimal Trajectory Proolem	Dr. John J. Swetits
140	The Role of Vortex Shedding in a Bluff-Body Combustor	Dr. Richard S. Tankin
141	An Investigation of Acetylcholine as a Neurotransmitter of Cerebellar Mossy Fibers	Dr. William E. Thomas
142	Unified Real Part of Susceptibility over Millimeter through Infrared Region	Dr. Ken Tomiyama
143	Numerical Modeling of Multi-phase Turbulent Recirculating Flows in Sudden-Expansion Ramjet Geometry	Dr. Albert Y. Tong

Report Number	Title	Research Associate
144	Development of Three Covariance Structure Models for Analysis of Performance Measurement Project Data	Dr. Robert J. Vance
145	Laminarization in Highly Accelerated Flow	Dr. Brian Vick
146	Development of Computer Assisted Instruction in Basic Electronic Trouble Shooting	Dr. Stephen A. Wallace
147	The Development of a Computerized System for Management Information and Inter-Office Communication	Dr. Yin-min Wei
148	The Processing Window for the Near Beta Ti-10V-2Fe-3Al Alloy	Dr. Isaac Weiss
149	Effects of Humidity on Gaseous Phase Adsorption of Trichloroethylene by Activated Carbon	Dr. Martin D. Werner
150	A Comparative Analysis of Whispered and Normally Phonated Speech using an LPC-10 Vocoder	Dr. Johnny R. Wilson
151	Cognitive Factors in Computer-Aided Fault Diagnosis	Dr. Krystine B. Yaworsky
152	Characterization of Ceramic-Ceramic Composites	Dr. Chyang John Yu

CENTRIFUGE MODELING OF STRUCTURAL RESPONSE DURING UNDERGROUND EXPLOSIONS - A PRELIMINARY THEORETICAL FEASIBILITY STUDY

BY

A. ANANDARAJAH

ABSTRACT

The basic principles of centrifuge modeling and the similitude requirements associated with the centrifuge modeling of geotechnical structures during explosive loading conditions are summarized. The potential of modeling explosive events is discussed with examples of recent centrifuge studies. The difficulties of modeling dynamic soil-structure interaction in the centrifuge are summarized and the need for a large capacity centrifuge for modeling explosive problems is discussed. Finally, a finite element program was developed in order to investigate the Coriolis and boundary effects associated with a dynamic centrifuge model test. The accuracy of the program was tested by analyzing an elasto dynamic problem and comparing the results with the lumbed-mass structural dynamics solution. The details of the analysis are presented. The follow-on research would involve the inclusion of an anisotropic hardening elasto-plastic bounding surface constitutive model for soils in the finite element program and the detailed investigation of the Coriolis and boundary efforts. A unified approach of solving explosive problems by exploiting the modern soil mechanics concepts and the centrifuge modeling technique is also presented.

New Synthetic Techniques For Advanced Propellant Ingredients: Selective Chemical Transformations and New Structures - Bis-Fluorodinitroethylamino Derivatives

by

Dr. Gloria L. Anderson

ABSTRACT

This report describes one phase of an ongoing study of chemical reaction transformations which may lead to energetic compounds with new or novel chemical structures, or which could lead to improved synthetic routes for known compounds that currently are expensive propellant luxuries.

The primary goal of the research is to develop a method of generating a new class of energetic ingredients for potential binders and placticizers, by introducing energetic groups into organic molecules via the nucleophilic triflate displacement reaction. The objective of this study was to evaluate the feasibility of introducing the energetic N,N-bis(2-fluoro-2,2-dinitroethyl)amino group into organic molecules by selective displacement of triflate esters. This is a key reaction in the synthesis of a new class of energetic binders and plasticizers.

The reaction between N,N-bis(2-fluoro-2,2-dinitroethyl)amine and 1,4-butaneditriflate has been examined in chloroform and benzene under various conditions. The results, though inconclusive, suggest that the reaction does not proceed to any appreciable extent in these solvents. However, the limited amount of data available from this

study precludes the possibility of drawing any conclusions regarding the feasibility of introducing the energetic bis-fluorodinitroethylamino group into organic molecules via triflate ester displacement. Further study is warranted.

The synthesis of the coreactants for this study, N,N-bis(2-fluoro-2,2-dinitroethyl)amine and 1,4-butaneditriflate, by a previously reported procedure, is described. A modified method for synthesizing the previously described 1,4-dibromo-2,3-epoxybutane is reported. A new compound, 1,4-di-N,N'-(2-fluoro-2,2-dinitroethylamino)butane is described.

Several recommendations regarding suggestions for continuation of this study are discussed.

INFRARED ABSORPTION SPECTRA OF SILANE AND DISILANE

by

Richard Anderson

ABSTRACT

The production of disilane in a dc discharge in a silane-argon gas mixture was spectrographically investigated in the infrared to verify earlier mass spectrographic measurements that indicated its formation. Disilane was definitely identified by absorption measurements in a White cell through which the gaseous discharge products passed. The production of disilane and the depletion of silane were evaluated for the discharge. Disilane production in the discharge was similar to the amount reported in some earlier work.

The spectral lines from high rotational levels of the (0,1) transitions and from rotational levels of the (1,2) transition of the ν_4 mode of silane were identified in a heated cell. This was a survey absorption spectrum at a resolution of 1 cm^{-1} to identify new lines which may arise from the first excited vibrational state. This information will be valuable in the tunable diode laser probing of a rf discharge to determine this excited state's population.

THE CHARACTERIZATION OF ^{14}C-SEROTONIN UPTAKE INTO CEREBELLAR GLOMERULI.

by

Deborah L. Armstrong

ABSTRACT

The uptake of serotonin into purified cerebellar glomeruli from bovine brain was investigated. Our findings provide support for the proposal that serotonin (5-HT) functions as a transmitter in this synaptic complex. Cerebellar glomeruli were isolated from bovine cerebellar vermis and subjected to a series of *in vitro* uptake analyses. Kinetic analysis indicated that glomeruli accumulate ^{14}C-serotonin at an high affinity uptake site whose affinity (Km) and velocity (Vmax) were calculated to be 5×10^{-7} M and 2.0 pmole mg.protein$\cdot$min^{-1}, respectively. The uptake site is concentrated within the pure glomerular fraction (PGF) of our preparations and diplays sodium and energy dependence. Suggestions for further studies on this serotonergic mechanism in the cerebellum is discussed.

AUTOMATIC CONTROLLER FOR SPACE EXPERIMENTS

by

Francesco L. Bacchialoni

ABSTRACT

This document reports the investigation on operational requirements and architecture of an automatic controller designed to support AFGL scientific experiments in space, particularly those to be flown in NASA Get-Away-Special containers. This controller is designed to minimize the workload of the operator, by testing automatically various subsystems of the experiment hardware, and conducting the experiment.

TWO-COLOR REFRACTOMETRY FOR ASTRONOMICAL GEODESY

by

John D. R. Bahng

ABSTRACT

Capabilities of a Two-Color Refractometer as an instrument for determining astronomical refraction quickly and accurately were analyzed. It is found that due to the limitation imposed by "seeing", the instrument is not expected to achieve accuracies necessary for astronomical geodesy. It can be employed as a useful means to study the irregularity and variability in the atmospheric refraction for a better understanding of the atmospheric structure.

Long Wavelength Infrared Emissions

from a Recombining Oxygen Plasam

by

James C. Baird

ABSTRACT

An experimental search has been made in the long wavelength infared in the region 4 to 14 μm in a plasma produced by laser initiation in pure molecular oxygen. Emissions at 3.87, 4.00, 5.44, 5.73, 5.97, 6.57, 6.88, and 7.43 μm were observed. Preliminary assignments have been made. The 7.43 μm emission is identified with $6g^5G^0 \rightarrow 5f^5F$; $6g^5G^0$ being 0.38 eV from the dissociation limit of OI. Studies of the 7.43 μm emission linewidth as a function of delay time after plasma initiation and as a function of total oxygen pressure have been made, and the empirical linewidth relation found to be:

$$\Gamma(t,P) = 0.177P(\text{torr}) - 3.31\,\tau_D(\text{microsec}) + 36.20\ \text{cm}^{-1}$$

with a standard deviation $\sigma = 1.39\ \text{cm}^{-1}$. Simple rate theories have been advanced to explain the absence of expected transitions and to help understand population mechanisms.

DEVELOPMENT OF A HIGH FREQUENCY LUNG VENTILATION MODEL FOR TESTING UNDER HYPOBARIC CONDITIONS

by

Mukul R. Banerjee

ABSTRACT

An artificial lung model was ventilated with small tidal volume and high frequency. The frequency ranged from one to twenty Hz with a maximum minute ventilation of 5 liters per minute. Under both the static and dynamic conditions no leak was detected which allowed gas to pass directly from the inspiratory line to the expiratory line of the ventilator. Measuring the expiratory flow and integrating its output gave an accurate measure of the inspiratory tidal volume of the lung. Introducing a compliant chamber in the inspiratory line made the inspiratory flow waveform essentially frequency independent. Follow-up work includes evaluating the performance of the system in live animals both at sea level and under hypobaria and hyperbaria.

ASTRONOMICAL OBSERVATIONS USING THE IMAGING CAMERA OF THE LARGE APERTURE INFRARED TELESCOPE SYSTEM

by

Alan F. Bentley

ABSTRACT

The potential of the Large Aperture Infrared Telescope System (LAIRTS) for scientific investigations using the Imaging Camera is investigated. Four classes of observation are identified. These are Solar System Observations, Galaxy Studies, Extra-Galactic Investigations, and Transient Phenomena. It is shown that studies with the imaging camera can produce significant new contributions in areas of current astrophysical research. Scientific programs of major importance in Galactic and extra-Galactic astronomy which can be carried out with the LAIRTS imaging camera are discussed. It is recognized that LAIRTS is the first, and presently the only, telescope system with the potential for making these critical observations.

SOME RECOMMENDATIONS FOR IMPROVEMENTS IN THE THEORY AND PRACTICE OF DOD INCENTIVE CONTRACTING

by

Richard H. Bernhard

ABSTRACT

Fundamental theoretical deficiencies are shown and revision is recommended in the DOD's newly proposed procedure for adjusting shared savings to encourage cost reducing capital investment by contractors. It is also shown that inconsistencies between conceptually correct economic figures and their counterparts computed under government accounting standards cause underallowance of intended contractor profit incentive. Also, though standard models under uncertainty allow the contractor to choose his sharing fraction for cost underruns and overruns so as to maximize his expected utility or, equivalently, his risk-adjusted value, it is shown that this approach does not, in general, yield Pareto-optimality and hence is not in the best interest of either the contractor or the government. Contrary to a claim in the literature, it is further shown that sharing may well be an incentive for cost reduction, but care must be used to assure Pareto-optimality in the final solution. Recommendations are made for follow-on research including joint consideration of time streams and uncertainty, multiattribute analysis, and other extensions in the theory.

SIMULATION OF RADAR RECEPTION FROM TERRAIN AND AIRBORNE TARGETS

by

Albert W. Biggs

ABSTRACT

The simulation of radar reception is developed with the contribution from the backscattering cross sections of terrain and airborne targets. For bistatic radar, only airborne targets are considered. Airborne targets include families of oblate and prolate spheroids. Terrain targets are developed in empirical form, requiring data from actual measurements of the particular terrain. Terrain includes vegetation, sea ice, man-made structures, glacial ice and snow, oceans, water-bodies, and geological structures.

USAF SPOUSE SURVEY: THEORETICAL MODEL, CRITIQUE, AND REVISION

by

L. W. Buckalew

ABSTRACT

Integrity of the Air Force mission is, in large part, contingent on personnel factors of job satisfaction, operational readiness, and retention. In an era of stable demand but decreasing supply in the workforce, there is increasing concern for the psychosocial welfare and influences of employees. The Air Force has demonstrably indicated its awareness of these factors and is particularly responsive to the family unit and the impact of its attitudes, needs, and expectancies. The Air Force Spouse Survey (AFSS) was developed as a research instrument to investigate relationships between spouse and family attitudes and job and retention variables. The present research effort critiqued this instrument with the goal of improving its reliability, content validity, and return rate. A theoretical and dynamic model, FAIMS (Family Attitudinal Impact on the Military System), which emphasizes psychosocial factors and processes was developed to aid in describing and explaining interactions between job variables and family attitudes. This model also contributed to expanded content domains of the survey. The end product was a revised and expanded Air Force Family Survey (AFFS) instrument which incorporates present efforts, previous USAF critiques, and respondent comments.

Ada COMPILER

EVALUATION AND VALIDATION (E&V) TAXONOMY

by

Mike Burlakoff

ABSTRACT

The Department of Defense Ada® computer programming language is supported in an Ada Programming Support Environment (APSE). In order to provide a means of assessing and evaluating APSEs, the Ada Joint Program Office (AJPO) formed an Evaluation and Validation (E&V) Task in June 1983. The goal of this task is to develop and provide to the Ada community the technology for the E&V of APSEs. Since an Ada compiler is the major component of an APSE, technology for the E&V of Ada compilers is needed. This research defines, develops and provides a taxonomy upon which the E&V of Ada compilers may be accomplished. Using the taxonomy approach, specific requirements and issues that should be evaluated are specified. Recommendations for improvement, refinement and expansion of the work are given.

SOFTWARE DRIVERS FOR THE Z-204 MULTIPORT INTERFACE CARD

by

Myron A. Calhoun

ABSTRACT

The design and implementation of a Software Driver Package for a Zenith Data Systems Z-204 Multiport Input/Output Card is described. The Z-204 card, an accessory for the Zenith Z-100 desktop computer, provides one parallel and four serial I/O ports for connecting to printers, modems, terminals, other computers, etc. User-oriented specifications for calling the Software Driver Package from Z-BASIC programs are given. Parts of the "USER's GUIDE" which was written as a supplement to the manufacturer's "Manual" for the Z-204 card are included in this report.

THE ANALYSIS OF A SINGLE BASE IN AN AIRLIFT OPERATION

By

M. Jeya Chandra
Ronald L. Wasserstein
Arthur M. B. Hogan

ABSTRACT

In this study, the performance measures of a single base in an airlift operation are analyzed, assuming that the inter-arrival times of the aircraft to the base are exponentially distributed. The crews arriving with the aircraft rest at the base for a constant amount of time before being ready to fly from the base. A certain number of crews are placed at the base initially in order to reduce the waiting times of the aircraft at the base. Closed form expressions for the probability distributions of the waiting times of the aircraft and crews at the base and the number of aircraft and crews waiting at the base are derived as functions of the mean inter-arrival times, the number of crews placed initially at the base and the duration of the rest period. The inter-departure time distribution of the aircraft from the base is also derived.

THE ROLES OF PEI AS AN ADDITIVE

IN EAK

by

Do Ren Chang

ABSTRACT

The ammonia gas liberated in a reaction by adding PEI directly into EAK is mainly due to its reactions with an AN component. The gas has been determined quantitatively. It has demonstrated that PEI also reacts with an EDD component. The reaction product called PNEI has been shown to be a 70% nitrated product of PEI. The chemical formula, molecular weight and heat of formation of PNEI has been obtained. If PNEI is an additive, it does not affect the phase diagram of EAK. A suggestion for an alternative process of making PEI additive in EAK without evolving harmful ammonia gas is offered.

Dynamics of Vortex Shedding and Quasi-large Scale Structures in A Bluff-Body Combustor

by

Huei-huang Chiu

The vortex shedding and the formation of quasi-large scale structures in a recirculating wake of vertically mounted bench scale bluff-body combustors are examined experimentally and the results compared with that of an analytical model. It was found that vortex shedding from the bluff-body occurs in the primary mixing layer and in the strong shear regime present within the wake in cold flow tests. Roll-up vortices shedding from the primary mixing layer ceases to occur in the combustion flow. Instead, quasi-large scale structures involving strong radial and tangential oscillations are observed. Theoretical predictions concerning the vortex shedding and its suppression, and the formation of quasi-large scale structures are in good qualitative agreement with experimental observations.

Investigating the Potential Application of an "Integrated" Resource Management System to Various Air Force Environments

by

Philip S. Chong

ABSTRACT

The primary purpose of this project was to investigate the feasibility of applying established techniques of Manufacturing Planning and Control such as "materials requirements planning" to problems in materials planning and control in various Air Force environments. The investigation opened up whole new areas of research which are significant and challenging.

The major accomplishments during the 10-week research period include:

(1) Four presentations and microcomputer demonstrations made to varous Air Force installations.

(2) The conversion of the source code of Materials Planning and Control Decision Support System (MPC-DSS) from the IBM personal computer to the Z-100 microcomputer.

(3) The development of a "marketing" report for potential users or interested parties in the Air Force.

(4) The export of MPC-DSS Source Code to varous Air Force installations.

(5) The confirmation of need and commitment to implement MPC-DSS by several installations at the Air Force Cryptological Service Center (AFCSC) and San Antonio Real Property Maintenance Agency (SARPMA), Texas.

Potential research in the future includes enhancements to MPC-DSS, further extensions in the implementation at AFCSC, investigation of a multi-users system and exploring its use in other applications.

LOW TEMPERATURE EXPANDABLE MEGAWATT PULSE POWER RADIATOR

by

Louis C. Chow

ABSTRACT

A feasibility study of a light-weight, low-temperature, expandable pulse power radiator was carried out. The radiator has a large volume to area ratio and is capable to act as a waste heat storage and to reject average power during the on- and off- peak period. The dynamic behavior of the radiator subject to some hypothetical duty cycles is predicted. The potential problem of damages caused by micrometeoroids is assessed. Two possible deployment/retraction mechanisms are suggested. It is concluded that the present radiator concept is a sound one and should be further developed. Suggestions for future research are offered.

EXPERIMENTAL EVALUATION AND DEVELOPMENT OF COMPONENTS FOR AN INFRARED PASSIVE LASER GYRO

by

David Y. Chung

ABSTRACT

Various forms of optical inertial rotation sensors, based on the Sagnac effect, such as active ring laser gyro (RLG), passive ring resonator (PARR), and fiber optic resonators (FOG), have been under development since the advent of the laser in 1960. Recently, a new concept utilizing micro-electronics and integrated optics, a micro-optic gyro (MOG), has been developed.

In the present work, the feasibility of developing a low cost, compact passive ring laser gyro (a combination of PARR and MOG) working in the infrared was studied. Initial experimental evaluation and development of components for this purpose were performed. An all fiber polarization modulator was designed and constructed to work up to two hundred Hz. This modulator can find applications in the all fiber configuration interferometer and gyros. Suggestions and recommendations for further research in these directions are also offered.

THE ELECTROMAGNETIC PULSE RESPONSE OF STRUCTURES WITH FREQUENCY DEPENDENT ELECTRICAL PROPERTIES

David K. Cohoon, Richard A. Albanese, John W. Penn

Abstract -- This paper is motivated by literature citing biological responses to pulsed electromagnetic radiation which are of a significantly greater magnitude than that of the same biological system exposed to continuous wave radiation with the same average power density. A computer program using contour integration was developed which predicts the pulse response of a Lorentz medium. The Sommerfeld- Brillouin first and second precursor waves are accurately calculated to about 12 decimal places even when the observation point is close to the surface of the scatterer. The inversion of the Fourier transform of the electromagnetic pulse response is accomplished by using Gaussian quadrature to integrate around a contour of finite length and by evaluation of residues. A function of frequency and position is determined which when integrated over a frequency interval gives the energy per unit volume imparted to the material by photons whose energies correspond to frequencies lying in the prescribed frequency interval. A computer program has been written which yields plots of this smoothed spectral distribution of energy density as a function of the logarithm of frequency for frequencies ranging from ten

Megahertz to the X-ray band. While we consider quantum mechanical limitations we conclude that even without this there is no significant X-ray contribution delivered to a Debye medium half space with electrical properties similar to that of human tissue by microwave pulses in the gigahertz range. A tool has been provided for studying the high frequency content of the energy delivered to experimental animals by pulsed microwave radiation. The paper is also concerned with how energy is distributed within the simulated biostructure after it has been transferred to the system by the electromagnetic pulse.

COMPARISON BETWEEN TWO ATMOSPHERIC BOUNDARY LAYER MODELS: SECOND-ORDER TURBULENCE CLOSURE VERSUS HIGHLY PARAMETERIZED, SIMPLIFIED PHYSICS

by

Frank P. Colby, Jr.

ABSTRACT

A one-dimensional model developed by Flow Analysis Associates of Ithaca, N.Y. has been brought on-line and successfully run on the Air Force Geophysics Laboratory's CYBER computer. Output routines have been developed and test runs completed. The model works as intended by Flow Analysis Associates.

Output from a simple one-dimensional model developed by Colby has been compared with the results from the Flow Analysis model, given the same initial conditions. The results suggest that the simple model is nearly able to match the performance of the detailed Flow Analysis model when only the gross structure of the atmospheric boundary layer is required.

A STUDY OF THE SHIVA STAR-TYPE INDUCTIVE PULSE COMPRESSION SYSTEM

by

R. Gerald Colclaser

ABSTRACT

The Shiva Star uses an inductive-store/opening-fuse pulse compression system to transfer energy from a capacitor bank to a plasma implosion load in a submicrosecond time frame. An electrical circuit-based approach was used to develop sets of first order differential equations to describe the system operation. The individual terms of the equation provide the requirements for computer models of the commutating fuse, the connecting surface tracking switch, and the imploding load. The computer codes were implemented in Fortran-77, augmented by subroutines available on the AWFL VAX 11/750. Time-dependent models of the fuse resistance and imploding load radius were based on experimental results. The variable resistance and inductance of the surface tracking switch were modeled based on arc parameters and assumptions of maximum arc current density. Recommendations for future research include refining the fuse model by adding current dependent equations, improving the surface tracking switch simulation, and using the revised program to study the effect of parameter changes on the overall efficiency of the complete system.

AN IDENTIFICATION OF THE HUMAN LIMITATIONS IN THE CONTROL ROOM OF WIND TUNNEL 4T

by

Gregory M. Corso

ABSTRACT

This research project focused on the engineering psychology problems in the control room of the 4T wind tunnel. The approach taken to identify these probems was through the use of information and decision flow diagrams, and function and decision allocation approaches. From these techniques various engineering psychology problems were identified and recommendations were made to resolve those problems. Suggestions for further research were also noted.

INTERNAL FLOW STUDIES OF A CLASS OF BALLISTIC LAUNCHER

by

Robert W. Courter

ABSTRACT

A simple time-dependent model of the internal ballistics of a two-stage light gas gun is briefly described. The gasdynamic flow field between the driving piston and the driven sabot is singled out for special study. This flow regime is idealized as a quasi-one-dimensional flow of an inviscid, compressible, real gas with arbitrarily moving longitudinal boundaries. A method of numerical solution of the governing partial differential equations is suggested. In addition, a rezoning technique for describing the time-dependent computational grid is presented.

DYNAMICAL SPECTRAL ANALYSIS FOR NONSTATIONARY PROCESSES

by

John F. Cyranski

ABSTRACT

The study of ionospheric scintillations is but one example of the use of spectral analysis techniques based on the assumption of stationarity in examining truly non-stationary processes. We provide an alternative formalism based on the expansion of finite-power processes in orthonormal functions. Expansion coefficients are estimated, taking as evidence integrals found from the data, using the MAXENT procedure. Results from simulation tests using a rudimentary program are presented and suggestions for further research are offered.

ABSTRACT

AN EXPERIMENTAL INVESTIGATION OF HUMAN TORQUE STRENGTH

by

S. Deivanayagam

Torque strength of a maintenance technician is an important factor for successful completion of maintenance tasks. It is influenced by the task location, accessibility, tool characteristics, and the individual characteristics. An experimental study was conducted to measure the maximum torque applied on a ratchet wrench under forty eight different task conditions simulating certain maintenance tasks. Ten males and ten females participated as subjects. The experimental apparatus consisted of a custom built torque strength measurement device and an INTEL 8080 microcomputer. The resulting data has been statistically analyzed and presented in tabular and graphical forms. This study was undertaken to provide certain ergonomic data for the CREW CHIEF computerized man model.

EFFECTS OF NUCLEAR RADIATION ON THE OPTICAL CHARACTERISTICS OF LASER COMPONENTS

by

Dr. Hermann J. Donnert

ABSTRACT

In view of requirements stemming from projects under the auspices of the Strategic Defense Initiative, work has been initiated to explore the effects of nuclear radiation on the optical characteristics of laser components. Pre-irradiation tests have been conducted and samples have been exposed to the fast-neutron environment in the beam stop of the Los Alamos Mason Physics Facility. Further experiments of relevance are in various stages of planning.

PHOSPHOLIPID METABOLISM IN A SYNAPTIC MEMBRANE PREPARATION ISOLATED FROM CEREBELLAR CORTEX

by

Robert V. Dorman, Ph.D.

ABSTRACT

The cerebellum is involved in the control of voluntary motor activity. In turn, the functioning of the cerebellum depends on the membrane phenomena related to the uptake, release and effects of neurotransmitters. We have examined some aspects of membrane biochemistry in a synaptic preparation isolated from bovine cerebellar cortex. We have detailed some metabolic pathways, in order to obtain basic information on the interactions of neurotransmitters and excitable membranes. We employed a purified gomeruli fraction, which contains intact synaptic structures, for investigation of phospholipid metabolism.

The purified glomeruli fraction contains the ethanolamine and choline phosphotransferase enzymes. These enzymes are necessary for the synthesis of the major membrane phospholipid components. We characterized these enzymes and estimated their kinetic constants. The properties of these enzymes are similar to those reported for other brain regions. We also found that the glomeruli particles can incorporate exogenous fatty acids into the membrane lipids. This mechanism may be used for further studies on the complex relationship between neurotransmission and membrane lipid metabolism.

A REVIEW OF COMPUTER SIMULATIONS FOR AIRCRAFT-SURFACE DYNAMICS

by

George R. Doyle, Jr.

ABSTRACT

In the past five to ten years the United States Air Force has developed a great deal of interest in aircraft operation on the ground, particularly their capability to takeoff and land on unpaved or repaired runways. This capability depends on: the strength of the airframe and landing gears; the ability of the pilot to function in a vibratory environment; and sufficient thrust of the aircraft to overcome soil drag, reach liftoff velocity, and takeoff in the available distance. The purposes of this report are to: first, review the computer simulations that have been developed for the prediction of aircraft response to austere airfield surface conditions; second, to comment on simulation techniques that could be improved in accuracy or running time; and third, to recommend future efforts that would improve the simulations.

CONSTITUTIVE MODELLING FOR BLAST INDUCED WAVE PROPAGATION

by

E. C. Drumm

ABSTRACT

The description of the stress-time history acting on a buried structure is a major source of error in the analysis of underground structures subjected to weapons loadings. The stess wave propagating spherically from the weapon is attenuated as it travels from the source. This attenuation is a function of the inelastic response of the soil, and results in an increase in the loading rise time or decrease in the loading rate. Since the inelastic soil response is a function of the loading rate, a wave propagation analysis should be conducted to determine the stresses on the structure. At the interface between the soil and structure, the stress is modified further by soil-structure interaction effects. Thus the stress on the structure is a function of both the structural and soil properties as well as the distance travelled by the stress wave. These related phenomena can be included in a numerical analysis, but the accuracy depends on the constitutive representation of the materials.

One-dimensional wave propagation experiments and impact tests with various soils are reviewed, and the attenuation as a function of the soil stress-strain response is discussed. The stress-strain response may change from "hardening" to "softening" when the loading rise time is less than 1 msec. Several elasto-viscoplastic models capable of representing this response are discussed, and recommendations are made regarding the use of existing numerical codes to perform soil-structure interaction analyses of buried structures. Future research suggestions are offered.

SiC REINFORCED GLASS-CERAMIC COMPOSITES

by

Charles H. Drummond

ABSTRACT

Low expansion, alkali-free zirconia nucleated and high zirconia cordierite glass-ceramic composites reinforced with Nicalon® SiC fibers were prepared. The matrix was synthesized from metal alkoxides and vacuum hot-pressed to theoretical density. The composites were vacuum hot-pressed with approximately 60 vol% fiber content.

Cordierite compositions with excess silica and alkali-free were expected to give a matrix with lower thermal expansion and a higher temperature stability than cordierite compositions. Partially stabilized zirconia was found to be present in both the zirconia nucleated and high zirconia compositions. The later also had a significant amount of zircon phase in addition to the high cordierite phase. In addition to phase identification of the vacuum hot-pressed samples by x-ray, phase identification studies were made on powdered samples calcined at various temperatures. DTA and TGA studies were also conducted.

Alkoxy-derived hydroxide slurries as well as slurries from calcined powders were impregnated into SiC yarn and formed into tapes. These tapes were then stacked and vacuum hot-pressed to fabricate the composites. Room temperature strength measurements were conducted on these composites using a four point bend configuration.

COMPUTER SIMULATION OF TI-6AL-4V AND RENE' 95 DISKS FOR THE T-700 ENGINE

BY

DR. DELCIE R. DURHAM

ABSTRACT

The isothermal hot forging of multiple turbine disks of Rene' 95 and Ti-6Al-4V for the T-700 engine is investigated. The process of forging multiple disks in a single operation is three-dimensional. A finite element program, ALPID, previously developed by Battelle, is used in the analytical modeling of the deformation. ALPID is a two-dimensional model capable of analyzing plane strain or axisymmetric large scale plastic deformation on an incremental basis. The effects of processing parameters upon the material behavior are incorporated in the model, once that material has been characterized by isothermal compression tests over a range of temperatures and strain rates. Judicious selection of planes of symmetry in the three-dimensional process can provide information on the variations in total effective strain and strain rate in the deforming material, as a first approximation. A two-step iterative technique is proposed where a combination of axisymmetric and plane strain analysis can be used to model the three-dimensional case more closely. Such a methodology requires additional remeshing and restart capabilities. Results of physical modeling with Plasticine in Plexiglass dies support the concepts of the two-step analytical approach.

GRAPHICS GENERATION AND IMAGE ENHANCEMENT AND RESTORATION TECHNQIUES

By

Dr. Terrence E. Dwan

ABSTRACT

A method for the generation of a three-dimensional best fit graphics display is investigated. A brief discussion of the basic problems involved in three-dimensional displays is followed by some recommendations. With several software packages available, I would recommend the purchase of one of them, in that it is almost always cheaper (man-hours, frustrations, etc.) to buy an existing package than to try to generate one in-house. A listing of some of these software packages is also included.

An overview with some detail for the image enhancement and processing problem is developed. Enough detail is given to reveal some of the complexities and computational difficulties with some of these digital processing techniques. An indication of the complexity involved in developing a capability for doing an image enhancement and the digital processing of an image will become apparent. General characteristics of image processing software is discussed. Existing software packages possessing some or all of these desired characteristics is identified with recommendations.

Structrual Modifications to Enhance the Active Vibration Control of Large Flexible Structures

by

FRANKLIN E. EASTEP

ABSTRACT

This study provides a method of vibration control of large space structures by the simultaneous and integrated structure and control design to reduce structural response from disturbances encountered. The formulation of a design scheme is obtained by structural modification of some nominal finite element model, which is controlled in optimal fashion by a linear regulator, to increase the active modal damping factor beyond that of the nominal structure. The structural modifications are determined by calculating the sensitivity of the closed-loop eigenvalues to structural stiffness variation. Because an optimal active control method is used, the sensitivity of the Riccati matrix to structural modifications are provided. Improvements in modal damping factors are specified and a method for determination of structural modification provided.

WETTING BEHAVIOR OF IMIDAZOLIUM-CONTAINING, ROOM-TEMPERATURE MOLTEN SALTS

by

James G. Eberhart

ABSTRACT

A room-temperature, molten-salt system composed of 1-methyl-3-ethylimidazolium chloride plus aluminum chloride has been developed and extensively studied at FJSRL over the last few years. The most promising application of this liquid mixture is as a battery electrolyte, and for this reason a study was undertaken of the wettability of various candidate battery component materials by the molten salt. Advancing and receding contact angles were determined for the binary melt as a function of such variables as mixture composition, chlorination of the imidazolium ion, replacement of $AlCl_3$ by LiCl, solid porosity, and solid surface cleaning procedure. Measurements were also made of the surface tension of the melt at one basic composition. Surface tension data was helpful in understanding the composition dependence of melt wetting behavior.

THE EMITTANCE OF PARTICLE AND LASER BEAMS AND MEASUREMENT OF THE ANGLE BETWEEN CROSSED LASER AND PARTICLE BEAMS TO HIGH PRECISION

by

Frederick R. Eisler

ABSTRACT

An operational definition method of emittance determination has been studied and methods for measuring and monitoring the emittance of H^--ion beams and H^0-atomic beams and laser beams have been investigated. It is shown that the emittance ellipses can be determined on a beam-pulse by beam-pulse basis and a recording of the pulse by pulse data made and a TV monitor presentation given for real-time observation. An interferometric method for measuring the large angular separation between a crossed laser beam and H^0-atomic beam, in resonant scattering, is proposed which can attain high precision.

A GENERIC LOGISTICS MODEL FOR EVALUATING OPERATIONAL READINESS OF A WEAPON SYSTEM

by

E. Emory Enscore, Jr.

ABSTRACT

The problem of evaluating a weapon system's operational readiness is addressed in this research. A generic mathematical model to do this is developed using a Markov Chain approach. A simple two state model (operational state and not operational state) is demonstrated with some interesting results. By considering limits of the transition probabilities, one finds that reliability related changes in the weapon system have a greater impact on operational readiness than do maintainability related changes.

A second Markov Chain model is given which refines the not operational state into several states. An airframe is used as an example to demonstrate this refinement process. The expanded airframe model contains six states. Fictitious data is used to explain the model. Two cases are used to evaluate the impact on readiness of changes in the airframe.

The final Markov Chain model described has functional transition probabilities. The probabilities are functions of reliability, maintainability and logistics support of the weapon system. No attempt is made to actually develop the functions. Only the mathematics of the model is given.

CHARACTERIZATION OF TURBULENCE THROUGH THE METHODS OF FIELD THEORY

by

John E. Erdei

ABSTRACT

One of the difficulties encountered in studies of turbulence is the sensitive dependence of the characteristics of the flow upon the specific configuration and on the initial conditions. This property is reflected in the chaotic behavior of many evolution equations. There may, however, be characteristics of turbulent flows which are general in nature, and may be used to describe a large class of flows. Drawing upon known characteristics of field theories used in the area of physics, we have initiated an examination of field theories which can be used effectively to describe the known properties of turbulence. Without requiring specific boundary conditions, we have computed the general form of the correlation function and self-energy insertion when a simple turbulent viscosity model is introduced into the Navier-Stokes equation. We have also examined a linear classical field theory whose solutions may be used to describe vortex dynamics.

ISSUES IN HIGH THROUGHPUT SIGNAL PROCESSING

BY

Adly T. Fam

ABSTRACT

The computational capabilities of state-of-the-art technologies for high throughput signal processing are assessed. Graphs for the computational rate per unit power and for the computational rate per unit volume are produced. Emphasis is on VHSIC phase I and II, with CMOS technology, and on GaAs chips. The study indicates an ever worsening I/O bottleneck and proposes using optical fibers as a digital link for interchip communication. The need for novel algorithms is emphasized. Further development of algorithms based on optimal partitioning and redundancy removal is encouraged and a new structure for digital filters based on functional iteration is proposed and examined for implementing interpolators. The need for novel fault tolerance techniques for repetitive and systolic architectures is emphasized. Power dissipation per chip or per unit volume is found to increase for advanced technologies, while the total power dissipation per a given task is found to decrease.

UPGRADE OF POLICY SPECIFYING

by

Bruce Feiring

ABSTRACT

This paper explores a procedure for Policy-Specifying for integrating n variables to generate a payoff value which reflects management policy. Currently, two variables at a time are integrated to reflect a payoff which is in turn combined with a variable or another payoff to obtain an integrated payoff. In particular, this analysis considers obtaining all possible combinations of n variables taken two at a time. This allows for a general modeling presentation by the analyst, where, when graphically presented, n-2 variables will be fixed, and the remaining two variables of interest will be analyzed by management for interactions or dependencies. Lastly, probabilities of success of individual i with ability a_i in job j with difficulty d_j are defined and combined with measurable benefits and/or costs to provide baseline models that allow for maximizing utility functions defined in terms of those measures. The baseline models are designed to provide a means of comparison for upgrading the Policy-Specifying procedure.

New Phenoxy Substituted Dianhydrides

by

William A. Feld

ABSTRACT

The conversion of 3,6-diphenoxydurene to 3,6-diphenoxypyromellitic acid was improved by eliminating salt coprecipitation. Synthesis and characterization of 3,6-diphenoxypyromellitic dianhydride was completed. Polymerization of 3,6-diphenoxypyromellitic dianhydride with p-phenylenediamine in m-cresol or N,N-dimethylacetamide results in the formation of a precipitate which is either the amic acid or the fully closed imide. Because formation of an isoimide requires a soluble amic acid, initial steps in the synthesis of 3,6-bis(4-phenylphenoxy)durene were undertaken to provide a more highly substituted dianhydride.

CYCLIC VOLTAMMETRIC AND COBRA ANALYSIS OF SYNTHETIC LUBRICANT DEGRADATION

by

Dr. Dennis R. Flentge

ABSTRACT

Examination of certain electrochemical properties of a lubricant can provide useful information regarding the quality of the lubricant and, indirectly, the condition of the turbine engine from which the lubricant was taken. The Complete Oil Breakdown Rate Analyzer, COBRA, and Cyclic Voltammetry have been used to examine several lubricant formulations under various levels of oxidative degradation. Rapid consumption of the anti-oxidant N-phenyl-1-naphthylamine was observed at 240°C with moderate consumption seen at 210°C.

GENDER DIFFERENCES ON SUBTESTS OF THE ASVAB AND THE RELATIONSHIP BETWEEN ASVAB SUBTEST SCORES AND PSYCHOLOGICAL/SOCIAL VARIABLES FOR MALES AND FEMALES

by

Cynthia A. Ford

ABSTRACT

The purposes of this investigation were to determine 1) if gender differences exist on the ASVAB, 2) on which 4 ASVAB subtests are the gender differences greater, 3) whether psychological/social variables account for significant variance on those ASVAB subtests which were found to be the most powerful discriminators between males and females, and 4) whether psychological/social variables of interest predict differently for males as opposed to females. The results indicate that gender differences do exist on the ASVAB. Auto and Shop Information, Word Knowledge, Paragraph Comprehension and Coding Speed Subtests were the most powerful discriminators between males and females. All psychological/social variables in this investigation were found to individually and collectively account for significant amounts of variance in all four of the ASVAB subtests. The mother's education appeared to be the most powerful predictor of performance on Auto and Shop Information, Word Knowledge and Paragraph Comprehension for males and females. The mother's education appeared to be the strongest predictor of scores on the Coding Speed Subtest for females, while the respondent's education appeared to be the best predictor of scores on the Coding Speed Subtest for males. The psychological/social variables in this study did not appear to predict differently for males than for females. Further research of this nature is recommended.

COMMUNICATIONS NETWORK SIMULATION TOPICS

by

Dr. Eddie R. Fowler

ABSTRACT

This report presents an executive summary of four communications network simulation topics. The first topic is a discussion of communications network simulation measures of effectiveness (MOEs). The second topic is a DELPHI approach to identifying appropriate communications network simulation MOEs. The third topic is a discussion of factor analysis techniques to establish relationships between MOEs. The fourth topic is a presentation of a "quick & dirty" (Q&D) network graph oriented simulation, GRAFTHY, for evaluating the robustness of a communications network for several different MOE when given a delay/probability for each link and node. Finally suggestions for further research in this area are presented.

NONPARAMETRIC CFAR DETECTION OF MTI RADAR SIGNALS IN HEAVY CLUTTER

By

Basil E. Gala, Ph.D.

ABSTRACT

The Generalized Sign, Mann-Whitney and Wilcoxon detectors are compared with a mode rank detector using Monte Carlo simulation. The mode rank detector is shown to possess desirable performance characteristics for MTI radar CFAR operation with low signal-to-clutter ratios. Simulation results establish nonparametric detectors as a promising alternative to adaptive procedures when clutter statistics are nonstationary.

BENCHMARK SOLUTIONS FOR THE SPENCER-LEWIS EQUATION DESCRIBING ELECTRON TRANSPORT IN AN INFINITE MEDIUM

by

Barry D. Ganapol

ABSTRACT

An analytical/numerical method designed to generate highly accurate solutions to the Spencer-Lewis equation for electron transport in an infinite medium with constant scattering properties is developed. The algorithm is embodied in the SLEET FORTRAN program to be used to assess the accuracy of proposed numerical transport algorithms for the investigation of radiation-induced damage in electronic components.

ELECTROMAGNETIC WAVES IN A DISTURBED ATMOSPHERE ENVIRONMENT

by

David S. Gilliam

ABSTRACT

The effects of a lower level absorbing layer above a conducting earth are examined in a mathematical model for Maxwell's equations. It is shown that in the presence of such an absorbing layer, at any height above the earth, the historic Zenneck surface wave is no longer present. The analysis of this problem is carried out using recently developed techniques which extend the classical methods from the spectral theory of unbounded self-adjoint operators on Hilbert space. These techniques allow for the determination of the electromagnetic field due to an arbitrary finite energy source with arbitrary time dependence as a superposition of "plane wave" modes of the conducting earth and "trapped" (or guided) wave modes due to the earth-absorbing layer waveguide as well as the nonpropagating static and quasistatic fields. Suggestions for further research efforts are offered including a more detailed examination of the trapped wave modes and the extension of these results to non-finite energy, steady state sources such as various dipole sources.

ALTERNATIVE COMPUTATIONAL METHODS FOR SEPARATED FLOWS ON PITCHED AIRFOILS

by

Larry A. Glasgow

ABSTRACT

At present the most widely used computational method for strongly-interacting separated flows on airfoils at high Reynolds numbers consists of first-order turbulence modeling in conjunction with the two-dimensional Reynolds equation. This approach is taken by default due to the difficulty associated with the full Navier-Stokes equations; it has a number of deficiencies, and the most serious of these is the inability to be extrapolated to untested conditions. The "spectral" method proposed by S. A. Orszag has been studied as an alternative--it is less intensive computationally, but it is known that the choice of eigenfunction expansion is critical to its success. A survey of possibilities has been completed including half-range Fourier sine series, and Laguerre and Chebyshev polynomials. The latter appear to be the best choice based upon the ability to describe the reverse flow solutions to the Falkner-Skan equation. Application of this technique to the non-primitive variable formulation results in one or more fourth-order ordinary differential equations; several of these have been derived and are presently being solved for a pitched flat plate.

MANUAL AND COMPUTER-AIDED SEQUENTIAL DIAGNOSTIC INFERENCE

by

Sallie E. Gordon

ABSTRACT

It is becoming increasingly obvious that computerized automation can be a useful aid for a wide variety of positions in the Command and Control network, where many of the tasks involve situational assessment or "diagnostic inference". To optimally combine human talent and computer-aiding systems we must know how the human operator performs the task unaided (and under what circumstances), what subtasks can be allocated to the machine, and what variables affect operator acceptance of the aiding system. This paper presents a theoretical model of the human performance of a diagnostic inference task when unaided by machine including the variables affecting those inference processes, and a preliminary model of how a computer-aiding system might be expected to fit into the diagnostic system.

ANGLE RESOLVED ION-SCATTERING SPECTROSCOPY-

A FEASIBILITY STUDY

by

Thomas P. Graham

ABSTRACT

An angle resolved ion-scattering system was assembled, tested and calibrated. The system performed well in both the constant transmission mode and the sector sweeping mode. Samples of gold, GaAs coated with gold and GaAs were studied using helium, neon and sodium ion beams accelerated to a number of different voltages. Angular studies were carried out over a limited range of angles. Good agreement was obtained with available theory in most cases. A number of deficiencies of the system were discovered and suggestions are made to remedy them.

ELECTROGASTROGRAM AND ITS EFFECTIVENESS IN EVALUATION OF MOTION SICKNESS

by

Edward Carl Greco, Jr.

ABSTRACT

The electrogastrogram (EGG) is a low frequency signal recorded from the abdomen with surface electrodes which is thought to represent gastric motility. Its frequency content range from 1 to 5 cycles/min. The EGG offers the potential for a direct observation of gastric motility which would be very useful as an index of nausea during motion stimuli. The EGG could be used as a biofeedback variable providing an indicator of gastric activity. Subjects monitoring their own EGG may be able to voluntarily control gastric activity during motion stimuli and thus learn to minimize their susceptibility to motion sickness. However, there are several problems associated with the recording techniques and interpretation of results which requires further investigation before the EGG can be used effectively for biofeedback treatment of motion sickness.

FAR-INFRARED ABSORPTION PROFILES FOR SHALLOW DONORS IN GaAs-GaAlAs QUANTUM WELL STRUCTURES

by

Ronald L. Greene

ABSTRACT

Previous variational calculations of the ground and 2p-like excited states of a shallow donor in a quantum well are extended to include the effects of an applied magnetic field and arbitrary donor position. The extended wave functions are then used in a theory for the absorption profile of shallow donor transitions in quantum wells. Absorption profiles for several donor impurity distributions are calculated and compared to recent far-infrared absorption experiments. The comparison with experiment is ambiguous, but the theory does suggest that the experimental samples may possess thin donor impurity layers at the interfaces between semiconductors.

DIGITAL SIGNAL PROCESSING APPROACHES FOR ANALYSIS AND EVALUATION OF COMMUNICATION SYSTEMS

by

Paul B. Griesacker, Ph.D.

ABSTRACT

Current approaches to analysis and evaluation of Communication, Navigation, and Identification systems are discussed with recommendations for AAAI-4 in preparation for the delivery of the Integrated Electromagnetic System Simulator (IESS). Digital signal processing approaches are discussed including benefits of the dual channel FFT analyzer in the presence of noise. Digital system simulations are examined including the need for introducing the RF path by analog methods. Jamming capabilities for IESS are recommended making maximum utilization of hardware already available to AAAI-4.

PRODUCTION RATE VARIATIONS COST MODELS

by

Thomas R. Gulledge, Jr.

ABSTRACT

This research examines a model that may be used to estimate the cost impact of production rate changes on a timely and real world basis. The first part of the research analyzes current models that are being implemented by Air Force Systems Command, and it is demonstrated that these models are deficient in their theoretical definition and empirical construction. The second part of the research presents the current status of the development of a more realistic rate variations model for the F-16 aircraft program.

THERMAL STABILITY CHARACTERISITCS OF SILAHYDROCARBONS

by

Vijay K. Gupta and Dennis W. Weatherby

Abstract

The silahydrocarbon class of materials were selected for investigation to provide candidate fluids usable over the temperature range of -54°C to 315°C. Thermal and hydrolytic stability of these fluids were the two main areas of concern. The following four silahydrocarbonschosen for investigation were: $CH_3Si(C_{10}H_{21})_3$, $CH_3Si(C_8H_{17})_2(CH_2)_3CH(CH_3)_2$, C_2H_5 Si-$(C_8H_{17})_3$ + C_2H_5 Si $(C_{10}H_{21})_3$, and $(CH_3)_2$ Si $CH(CH_3)_2C_{14}H_{29}$. The thermal stability studies of the above silahydrocarbons were conducted with respect to temperature, the heating time, the moisture content, and the nature of the metal container. It appears that silahydrocarbons $(CH_3)_2SiCH(CH_3)_2$-$C_{14}H_{29}$ and $CH_3Si(C_8H_{17})_2(CH_2)_3CH(CH_3)_2$ are slightly more stable as compared to the other two silahydrocarbons. The branching of one of the substituent group seems to have contributed to the added thermal stability. More than 90 percent of the silahydrocarbon CH_3 Si $(C_{10}H_{21})_3$ was decomposed when heated at 398.9°C for 6 hours, and there was little or no decomposition of the above hydrocarbon until the temperature of 329.8°C. The presence of 0.2% moisture and the metal container of the bomb material also have no significant impact on the thermal decomposition characteristics.

Calculations of Electron Spin Resonance Coupling Constants

by

Hendrik F. Hameka

Abstract

One of the current research areas of the Frank J. Seiler Research Laboratory is the thermal decomposition of energetic materials. A major part of the experimental information of these types of chemical reactions is derived from electron spin resonance (ESR) experiments. In order to interpret the experimental data, it is useful to have theoretical predictions of the ESR coupling constants of various possible reaction intermediates. We feel that the most effective procedure for calculating ESR coupling constants is the use of the unrestricted Hartree-Fock method (UHF). We first verified the accuracy of UHF results by calculating the ESR coupling constants of some typical organic radicals. The agreement between theory and experiment was generally poor, and we attributed the poor agreement to spin contamination of the UHF wave function. We derived a simple procedure for removing the spin contamination from the UHF function, and we found that the corrected results agree satisfactorily with experiment. We plan to utilize this procedure for theoretical predictions on organic radicals that are relevant to the thermal decomposition of energetic materials.

Effects of Pyridostigmine on Performance of Mission-ready Pilots in the OT Simulation Facility

by

Arthur E. Harriman

ABSTRACT

A study was designed for the purpose of studying the effects of pyridostigmine on pilot performance in the AFHRL/OT flight simulation facility. In this way, usefulness of the drug as an agent of chemical defense for USAF aircrews against nerve agents of the organophosphorus anti-cholinesterase series may be further assessed. The study was planned so that the subjects, who are mission-ready pilots, will be tested in the flight simulator during the course of a double-blind procedure in which the pilots are or are not under the influence of the drug while wearing or not wearing protective gear. Permutations of the procedure will be counter-balanced among subjects. Both behavioral and physiological measures will comprise the dependent variables. The results will be treated by analysis of variance for an experiment of the treatments-by-treatments-by-subjects design. At all times, the subjects will be monitored by a licensed physician in the possibility that there are side-effects from this medically useful and well-tolerated drug.

PROPULSION FACILITY PLANNING FOR TEST INFORMATION PRODUCTIVITY IMPROVEMENT WITH EMPHASIS ON DATA MEASUREMENT UNCERTAINTY IN THE ENGINE TEST FACILITY

by

Doyle E. Hasty

ABSTRACT

High subsonic, transonic, and supersonic propulsion system testing at one of the most unique aerospace testing facilities in the world, the Engine Test Facility (ETF), requires that maximum use be made of today's increased computational power, advanced information management systems and high-speed digital data acquisition systems. The heart of ETF was created in Germany in 1944 as the Bavarian Motor Works (BMW) which was later dismantled after the war and shipped to the United States. The early 1950's supported construction of ETF.

Various expansions and adaptations of this facility have continued for over thirty years to the point that ETF has not only played a key role in the development of many of the United States' aerospace programs, but will continue to play that role for decades to come if state-of-the-art modernization can be designed and implemented into this facility.

The objective of this research analysis is to evaluate new test techniques, data acquisition processes, data reduction techniques, data displays and analysis techniques to improve and modernize the propulsion test information process. A special emphasis was to analyze methods for improving and monitoring the data accuracy or data uncertainty of various test parameters.

A STUDY ON POINT DIFFRACTION INTERFEROMETRY

PLUS

HOLOGRAPHIC MEASUREMENTS OF A TURBULENT BOUNDARY LAYER ON A ROUGHENED WIND TUNNEL WALL

by

A. George Havener

ABSTRACT

The general theory of a point diffraction interferometry is discussed along with a description of a specific system for direct application to wind tunnel testing. Problems involved with the use of a point diffraction interferometer, and plans for continued developments and applications plus recommendations for construction of an improved system are also presented. Additionally, holographic interferometric measurements of a two dimensional, turbulent boundary layer on a roughened wall of a Mach 3 high Reynolds wind tunnel are presented in direct comparison to similar measurements of a turbulent boundary layer on a smooth wall of the same facility. Plans for detailed reduction of these interferometric data to density and velocity distributions are also discussed.

EFFECTS OF TEMPERATURE AND REACTANT SOLVATION UPON THE RATES OF GAS-PHASE ION-MOLECULE REACTIONS

by

Peter M. Hierl

ABSTRACT

The rate constants and the product branching ratios for the nucleophilic displacement reactions of CH_3O^- and $OH^-(H_2O)_n$ (where n = 0,1, or 2) with the methyl halides, and for the proton transfer reactions of CH_3O^- and $OH^-(H_2O)_n$ with acetonitrile and the hydrogen halides have been measured in the gas phase over the temperature range 200-500 K, using the AFGL selected ion flow tube (SIFT). The rate constants of the fastest reactions were found to be very close to the collision rate. Reactant solvation was found to decrease the rates of the nucleophilic displacement reactions, most significantly in the case of the least exothermic reactions, but was found to have little effect upon the rates of the proton transfer reactions. Likewise, increased temperatures decreased slightly the rates of the nucleophilic displacement reactions but had less effect upon the rates of the proton transfer reactions.

A MONTE CARLO SAMPLING OF BDR TIMES

by

Paul C. Hoffman

ABSTRACT

A computer simulation study of BDR times was conducted. Statistical analyses of field tests were performed and repair activities identified. Simple regression analyses were applied to formulate relationships between crater size and repair activities. Based on statistical and subjective inputs a probabilistic model was developed and a basic source program compiled. Simulations were conducted to determine both mean crater repair times and the respective standard deviations. Recommendations were proposed to further enhance the simulation modeling of repair operations.

BISMUTH SILICON OXIDE: SAMPLE VARIABILITY INVESTIGATED WITH THERMALLY STIMULATED CONDUCTIVITY AND THERMOLUMINESCENCE

by

Brian W. Holmes

ABSTRACT

We used thermally activated conductivity (TSC) and thermoluminescence (TL) to survey a number of different crystals of bismuth silicon oxide, $Bi_{12}SiO_{20}$ (BSO). Samples were irradiated at liquid nitrogen temperatures with uv light from anHg lamp and then warmed to room temperature. Three principal electron traps are observed, resulting in peaks in TSC and TL; the peak temperatures (T_m) were near 160 K, 235 K, and 298 K. Observed TSC and TL signals varied from crystal to crystal, but were similar for different samples of the same crystal. However, the TSC and TL spectra of a crystal differ. We offer a simple explanation of the systematic differences in peak heights and T_m values that are seen in comparing TSC and TL results in individual samples. Using initial rise techniques, we obtain thermal activation energies (E_A) consistent with an earlier measurement $E_A = 26\ T_m$. Attempts to calculate trap densities yield results which differ by several orders of magnitude. We propose further work to learn whether the variations in TSC and TL spectra are correlated with variations in trap densities, and to gather stronger evidence of the fundamental nature of electron traps in BSO.

Comparison of Periosteums from femur and Vertebral Bone

by

Gwendolyn B. Howze

Abstract

Periosteum samples from lumbar and thoracic vertebrae have been studied by scanning electron microscope. Vertebral periosteum conforms to the description developed for femur periosteum during the 1983 SFRP and 1983 RJP.

Collagenous fibers are the most numerous structural compone. The collagenous fibers are composed of fibrils aligned in parallel array. The fibers are disrupted by collagenase of very high purity. In addition, a simple cryofracture technique was used to study the internal structure of the collagenous fibers and blood vessels.

A network of fine fibrils similar to that seen in femur periosteum has also been visualized. The mesh seems less plentiful in vertebral periosteum. Since treatment with very pure collagenase destroys the network, it is concluded that the network is equivalent to the recticular fibers of light microscopy. The presence of the fibrils in periosteum, and their identification as reticular connective tissue has not previously been reported in the literature.

In both types of periosteum, the osteogenic or combium layer is very cellular. A large proportion of the cells have on in situ organization which has the appearance of a stratified squamous epithelium. The fibril mesh work is usually disposed between the cell layers. Periosteum dissociation by collagenase has been an effective method for studying cellular variety.

As expected, vertebral periosteum has a very rich blood supply.

ON A THIN-LAYER NAVIER-STOKES CODE AND TRANSONIC PROJECTILE AERODYNAMICS

by

Chen-Chi Hsu

ABSTRACT

An Axisymmetric thin-layer Navier-Stokes code and a grid generation code have been installed and studied for their application, implication and effectiveness to the computation of transonic projectile aerodynamics. Preliminary numerical results obtained for four different flow cases, M =0.91, 0.94, 0.96, and 0.98, seem to indicate that the thin-layer Navier-Stokes code can provide satisfactory results if a good adaptive grid network is used in the computation. It clearly indicates the importance of developing an automatic adaptive grid generation code for use in the Navier-Stokes code. Moreover, additional numerical experiments are required to assess the accuracy of the algebraic turbulent model programmed in the code for the flow characteristics downstream of a shock.

EFFECT OF DISPLAY DYNAMICS IN MANUAL CONTROL TASKS

by

Mario Innocenti

ABSTRACT

New advanced displays have shown to alter the flying qualities of aircraft. Present handling quality-specifications do not include the effect of display when the manual control task is performed. The present research performs a preliminary of the influence of display in a single axis pursuit tracking task. The display is modeled by a set of parameters and or relation between these parameters, tracking performance and pilot ratings is established using a fixed base simulation. Suggestions for further research on this area are offered.

COMPUTATIONAL STUDY OF RAMJET COMBUSTOR FLOW FIELDS

by

Kakkattukuzhy M. Isaac

ABSTRACT

Numerical study of the typical ramjet/turbojet combustor flowfield has been carried out. The predictions show good agreement with the recently reported experimental data. The improvement in the prediction result from more realistic specification of the initial conditions and differences in the turbulence model used. Areas of deficiency in the computational method are identified and suggestions for further research for removing these defficiencies are offered.

Numerical Characterization of Microstrip Discontinuities on Thick Substrates

by

Robert W. Jackson

Abstract

Microstrip discontinuities have heretofore been characterized by models which do not include surface wave or radiation effects. In this work, the microstrip step discontinuity is investigated by numerically solving an integral equation which was derived using the grounded dielectric slab Green's function. This technique includes the surface wave and space wave effects which are expected to be important on thick substrates. Using a moment method technique the current is expanded in terms of longitudinal sinusoidal and piecewise sinusoidal modes. S parameters are obtained. Results are promising but indicate that transverse currents may be important.

ADVANCED PHYSICAL MODELING/WEDGE TEST DEVELOPMENT

by

Vinod K. Jain

ABSTRACT

When an analytical model is developed to predict the behavior of a physical system, it is necessary to check the validity of the model by experimental procedure. An effort was directed to develop a laboratory test, the wedge test, to the level of a standard test to verify the analytical results of the ALPID computer program, which was designed to simulate the metal flow in deformation processing. The test employs a wedge-shaped specimen which is compressed in a die to study 2-dimensional and 3-dimensional deformation processes.

Tooling was designed for the 2-dimensional and 3-dimensional wedge tests, and the dies are currently being fabricated. A grid pattern, to be printed on the meridian plane of the specimen by a photochemical process, was developed. An analytical formulation has been developed to compute the various strain components using the dimensions of a deformed and undeformed grid.

DEVELOPMENT OF A VEHICLE FLEET ANALYSIS SYSTEM

by

Bruce N. Janson

ABSTRACT

This report documents the functional specification, design and development of a prototype vehicle fleet analysis system. To facilitate modular development, the system was divided into three functional areas: mainframe-to-micro communication, database management, and fleet analysis capabilities. The eventual system will be comprised of a set of micro-computer based modules that will enable more effective utilization of transportation resources by Air Force vehicle fleet managers and staff. Key requirements of the system configuration are that:

a. A smooth communication link between the micro-computer and the mainframe Vehicle Integrated Management System must be established.

b. Database structures must be compatible with each functional area of the system.

c. The system must be highly interactive and instructive to the user.

d. The system must be entirely menu driven and capable of performing most individual requests within seconds.

Since efficient mainframe-to-micro communication had not yet been established, one major task of the project was to compile to sample database for testing prototype modules as they are developed. Monthly data from Randolph Air Force Base was used for this purpose. A final major task of the 10-week research period was to develop an initial data display and graphical analysis demonstration module. This program was used in later conferences and roundtable discussions to focus attention on potential capabilities, user needs and technical considerations for a system of this type. Recommendations for how to best continue the development process and important research areas to investigate are made.

PHOTOGRAPHIC EMULSIONS FOR PREPARATION OF HOLOGRAPHIC FILTERS

by

Charles R. Jones

ABSTRACT

High resolution photographic emulsions are widely employed for the production of holographic filters to be used in coherent optical processors. Experimental efforts to accurately characterize such emulsions are reported here. Techniques for obtaining transmittance versus exposure are described and some results reported. An analytical procedure for treating some effects of emulsion non-linearities by use of a polynomial representation of the response curve is also presented.

FRACTURE BEHAVIOR OF CROSS-PLY GRAPHITE/EPOXY COMPOSITE LAMINATES

by

Walter F. Jones

ABSTRACT

A study of the effect of fiber failure and matrix cracking on the strength of cross-ply graphite/epoxy composite laminates using both analytical and experimental techniques is presented. An improved, second order shear lag theory which models a unidirectional fibrous composite with broken fibers is developed and compared to earlier first order shear lag theories. It is demonstrated that the second order theory provides considerable improvement over first order theories in its predictions of longitudinal fiber stress and transverse matrix stress. Also, an experimental investigation of the internal damage growth in cross-ply graphite/epoxy laminates is described. Acoustic emission techniques are used to monitor damage present at various load levels during static loading. It is shown that the acoustic emission events coming from internal damage such as fiber breaks, matrix cracking, and delamination appear to have very different characteristics in terms of amplitude, duration, rise time, and energy. A discussion of the various characteristics of acoustic emission events and their relation to the actual types of damage present in a laminate is presented.

THE OPTIMAL CONSTRUCTION OF SYNTHETIC DISCRIMINANT FUNCTIONS FOR OPTICAL MATCHED FILTERS

by

Robert R. Kallman

ABSTRACT

Synthetic discriminant functions (SDF's) for optical matched filters have potential use for pattern recognition. A variety of large intricate programs were designed, written, debugged, and tested. The purpose of these programs is to compute optimal SDF's modulo certain constraints and compare them to one another. A guiding principle throughout this work is that objective numerical criteria be applied to determine what is a "good" or "optimal" SDF. These programs were tested using 36 infrared tank images. For example, one of the programs picks out the best 4 from the 36 tank images and manufactures an SDF from them. Two other programs, whose purposes are to discretize an SDF in an optimal manner so that an optical hologram of it can actually be manufactured, were designed, written, debugged, and tested. These two programs are somewhat different from one another, for each tries to drive its own special error estimate to 0. There are many, many interesting and important questions which remain to be investigated in this area of research. They are discussed in this report.

STRESS AND AIRCRAFT MAINTENANCE PERFORMANCE IN A COMBAT ENVIRONMENT

by

William D. Kane, Jr.

ABSTRACT

This effort examines the impact of stress on the performance of aircraft maintenance in a combat environment. The theoretical literature and research and cases from actual combat situations indicate that performance could be significantly degraded. The literature is not clear on a definition of stress and no practical measure of stress exists. Also, the relationship between stress and performance is not accurately predictable. In addition, maintenance capability will be degraded through psychological casualties. The intensity of the battle will dictate the psychological casualty rate, but most of them will be returnable to duty in three or four days given the proper treatment. The shape of the relationship between combat stress and performance is suggested and recommendations are made as to what additional research might be conducted.

FINITE ELEMENT ANALYSIS OF CENTRIFUGED CONCRETE CULVERTS

by

Yong S. Kim

ABSTRACT

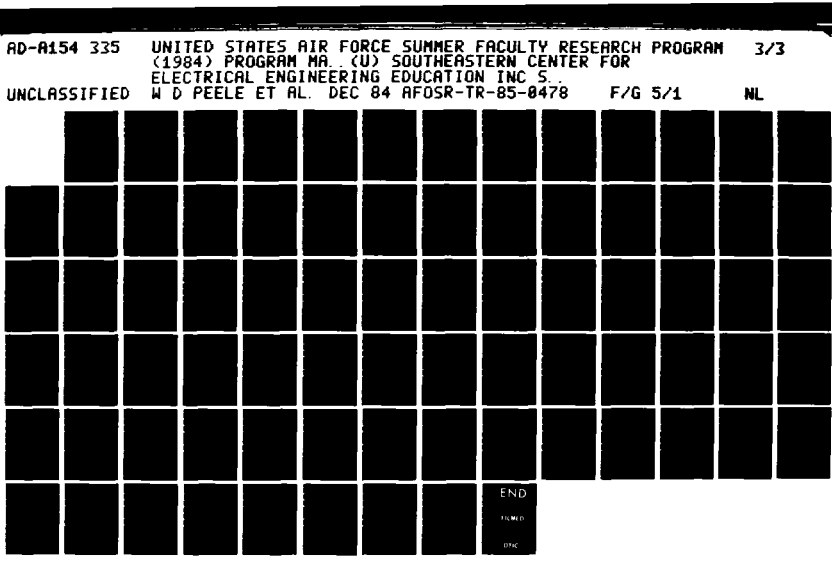
This study shows that finite element analysis can be a useful tool in examining the validity of the results of centrifugal model testing as long as the constitutive relationships for soil are representative of real ones. The quasi-theoretical results obtained from the finite element computer code, CANDE, are compared to the measured behavior of a 4.3-inch diameter instrumented culvert subjected to a gravity force of 35g in the centrifuge. A comparison of the quasi-theoretical and actual behavior shows good correlation. Two soil models, a linear model and Duncan's hyperbolic model, were used to show the influence of the constitutive relationships for soil on the culvert response in the finite element analysis.

Acoustic Emission in Composites

by
Ronald A. Kline

ABSTRACT

Acoustic emission (AE) phenomena in composite materials is examined both theoretically and experimentally. Theoretically, the effect of material attenuation is introduced into an AE model to aid in separating source characteristics from propagation effects in measured AE signals. AE waveforms in composite samples were measured for controlled experiments. The source for these experiments was primarily restricted to the fracture of a single graphite fiber in an epoxy matrix and localized at a single point. The normal component of the surface displacement was measured at epicenter using a point contact, conical sensor. In contrast to previous work in this field, in analyzing the signals attention was focused on the initial portion of the AE waveform rather than long term signal behavior which is dominated by internal specimen reflections. For comparison, AE waveforms on fiber free samples are also shown.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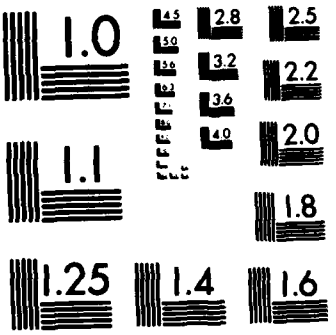

PROCESS CONFIGURATION ALTERNATIVES FOR SEPARATION OF GAS MIXTURES BY PRESSURE SWING ADSORPTION

by

Kent S. Knaebel

ABSTRACT

Air separation has two important potential applications for military and commercial aircraft: to provide oxygen for life support of the crew and/or passengers, and to supply nitrogen as a means of repressurizing fuel tanks as they are depleted (or during descent). At present, technology is being developed by vendors to meet these needs with independent systems. The goal of the research described in this report is to establish the feasibility of conducting both of these separations in a common system. Results obtained by computer simulation indicate that the combined separation is feasible, and may be significantly more efficient than the independent systems, because essentially no by-products are released. Therefore, the amount of engine bleed-air that is necessary to extract both purified oxygen and nitrogen is minimized. Recommendations for future research are described.

THE DISTRIBUTIONAL ANALYSIS OF CONTRAST SENSITIVITY MEASURES

by

David L. Kohfeld

ABSTRACT

Visual contrast sensitivity measures were obtained using a video display that generated vertical sine-wave gratings. Threshold contrasts were determined using three different methods of stimulus presentation: Bekesy Tracking (Experiment 1), and the methods of adjustment and increasing contrast (Experiment 2). An inverted-U described the general form of contrast sensitivity functions for all three psychophysical methods, thus confirming that visual resolving power is best at intermediate spatial frequencies and progressively less keen at relatively extreme frequencies. The data from the Bekesy Tracking procedure were collected into separate distributions for the ascending and descending trials, and deconvolving the former distribution from the latter resulted in a model that was exponential in form. This analysis of component processes suggested that contrast sensitivity measures are comprised of at least two component processes, only one of which reflects sensory sensitivity, the other(s) having to do with undesired response-criterion bias. In general, the results indicate that the method of increasing contrast generates the most "criterion-free" measures of contrast sensitivity. These measures could serve as the best predictor of the contrast sensitivity required in other tasks, such as performance in a visual simulator, in which precise visual resolution is essential.

THE RELATION BETWEEN HARD X-RAY BURSTS AND TYPE II RADIO EMISSION

by

Gabriel Kojoian

ABSTRACT

The question of the relationship between the hard x-ray burst flares (HXRB) and the companion type II radio emission is investigated. An apparent positive correlation exists between the type II starting frequency (fundamental) and the delay between the peak intensity of the HXRB's and type II onset time. Suggestions for future research in this area are offered.

THERMAL LAYER DEVELOPMENT WITH ENERGY FLUX AT THE GROUND/AIR INTERFACE

by

Arthur A. Kovitz

ABSTRACT

The thermal layer at the ground/air interface, induced by blast radiation deposited in the ground, is studied using a one-dimensional version of the HULL code as the numerical tool. Energy flux at the interface is the sole agent causing disturbances in the air above. The calculations are qualitatively consistent with the results of others, showing weak thermal coupling between ground and air (a thermal layer no greater than 2m thick). Calculations also reveal the dependence of the results on cell size, and suggest several possible paths for determining the "correct" cell size. Work should continue on establishing a method for rationally eliminating cell-size dependence within the framework of the HULL, one-dimensional code written for this analysis. The ultimate goal is to provide a thermal layer segment for HULL that can be valid over a broad spectrum of events; i.e., that does not depend primarily on experimental correlations.

Computational Fluid Dynamics Grids-
Flow Properties Interpretation Algorithm

by

Madakasira G. Krishna

ABSTRACT

Plane of intersection between a specified (arbitrary) plane and an arbitrary three-dimensional grid on which internal flow is simulated is developed. Flow properties of interest are interpolated at a network of points on the intersected surface. A computer code is developed which needs very little user interference. Suggestions for further research in this area are offered.

DEVELOPMENT OF AN OPTICAL

MULTICHANNEL ANALYZER SYSTEM

by

Raj. M. Krishnan

ABSTRACT

The objective of the research is to develop an optical multichannel analyzer system which is capable of recording Raman Scattered light over a wide band width simultaneously, so that time dependent phenomena can be studied. A varian triple monochromator was interfaced to a Hamamatsu Camera through an image intensifier. The output of the camera was interfaced to a PDP 11/23 plus computer. The varian spectrometer was modified so that both the multichannel capability and the traditional photon counting system could be used. These objectives were achieved. Suggestions for improving the system are offered.

INTERLAMINAR SHEAR TESTING OF CARBON/CARBON COMPOSITES

by

William Kyros, Ph.D.

ABSTRACT

The goal of this effort is to define a shear test to determine accurately the interlaminar shear strength and shear modulus for 2-D, fabric reinforced, carbon/carbon advanced composites of thicknesses comparable to those envisioned for typical turbine engine components (about 1/4 inches thick and less).

A review of the literature on shear testing was performed and methods suitable for determining the interlaminar shear strength of thin, 2-D carbon/carbon materials were assessed. Methods for measuring shear strength and modulus on thick sections were assessed for their potential to be modified to the testing of thin sections on the order of 1/4 inch and less. The assessment considered torsion, 10° off-axis tensile, $\pm 45^{\circ}$ balanced laminate tensile, rail shear, Iosipescu, slotted or double notched specimens, short beam bending and all tests analogous to those used in the testing of adhesives.

Two shear tests were developed which offer the best potential for satisfying the carbon/carbon shear test requirements. They are a torsion shear and an Iosipescu test. Fixtures for the Iosipescu test were designed as part of this effort.

TWO-DIMENSIONAL MEDIAN FILTERS FOR IMAGE PREPROCESSING IN MACHINE RECOGNITION

by

David C. Lai

ABSTRACT

The aim of this project is to explore and evaluate the effectiveness of median filtering and median/inverse filtering in facilitating machine recognition, and to gain insight into the design of practical preprocessors for automatic pattern recognition systems. 2-D median filters of various shapes and sizes are first evaluated and compared based on their performances in machine recognition under a particular degradation condition. Based on this result, the median filter with the best shape and size was selected and used throughout the experiment for measuring its performances in machine classification under various degradation conditions. This 2-D median filter was also used in conjunction with inverse filters to form preprocessors. Their performances in enhancing automatic pattern recognition were measured and compared. Results are reported and suggestions for future research are given.

PSYCHOLOGICAL CORRELATES OF PHYSIOLOGICAL INDICATORS OF STRESS-RELATED DISORDERS: A SEARCH FOR STRUCTURE AND RELATEDNESS

by

Charles L. Lardent, Jr.

ABSTRACT

The detrimental consequences of stress have emerged as a major concern among diverse professional domains: medicine, psychology, sociology, human engineering, organizational science, management, etc. Stress influences not only individual health, but is intermeshed with a host of interrelated variables that strongly affect individual and organizational performance. This study is an inaugural and exploratory investigation of the relatedness of numerous personality, motivational, and biographical measures to established physiological indicators of stress-related disorders among a sample of high-performing, senior-level military officers and their spouses. The findings, only a select few of which can be presented here due to space limitations, reveal an unmistakable and significant complex of relationships as regards physiological and psychological indicators of stress. Several very significant findings emerged that have special relevance to the military. First, the conventional views and implications of the Type A Behavior Pattern are not entirely appropriate nor applicable to senior-level military officers. Second, an officer's rate of promotion is related to the ratio of total serum cholosterol divided by high-density lipoproteins, but the relationship is not linear. Third, there is a clear, seemingly inherent, difference between males and females on both psychological and physiological correlates of stress.

OPTICAL BISTABILITY WITH LIQUID MEDIA:

EXPERIMENTAL STUDIES AND THEORETICAL PREDICTIONS:

by

N. M. Lawandy

and

D. L. MacFarlane and W. S. Rabinovich *

ABSTRACT

We have experimentally studied optical bistability (OB) in a Fabry-Perot etalon containing a variety of nonlinear liquid media in the quasi steady state limit. We have studied Kerr effect OB using CS_2, 1,2,dichloroethane, and the effects of the single photon absorber Kodak 9860 dye on this process using Q-switched laser pulses at $1.06\mu m$. This work indicates that previous studies using BDN dye dissolved in 1,2,dichloroethane were misinterpreted as the solvent alone can contribute to hysteresis via Kerr effects. In addition we have observed for the first time OB in a liquid using two-photon excitation. These experiments were performed using Rhodamine 6G in methanol solvents. Finally, we have undertaken a theoretical study of the transient response of an adiabatically following, non-dispersive, absorptive medium in a cavity. The results predict an asymptotically stable transient analogous to relaxation oscillations in laser systems. Preliminary experimental results indicate that we may have observed this effect.

* Mr. D. L. MacFarlane and W.S. Rabinovich were graduate students actively participating in this work.

SURVEY OF HIGH-ENERGY MOLECULAR SYSTEMS

by

E. Miller Layton, Jr.

ABSTRACT

We have undertaken a theoretical survey of unusual molecules with potential for storing large amounts of energy in a conveniently accessible form. We have especially considered molecular systems containing helium because of the large energy separation between ground and excited states in the helium atom and also because of recent work indicating the possibility of an unusual stabilizing mechanism for helium in the high-spin triplet state. The stabilizing mechanism is identified, promising systems are catalogued, theoretical calculations are proposed, and possible synthetic pathways are reported.

REWRITE OF AFM 28-345

by

Evelyn J. Thompson Leggette

ABSTRACT

The objective of the project was to rewrite selected nontechnical sections of AFM 28-345, Contingency Operation/Mobility Planning and Execution System (COMPES-LOGMOD-B) to make it more readable and easy to understand.

A thorough review of the literature was conducted on readability; Fry's Readability Graph was applied to selected sections to ascertain the appropriate grade level of the manual; a questionnaire was developed to determine the opinions of the users of the manual relative to format, sentence construction, vocabulary, reading and educational levels; and, any other suggestions for improvement.

Based on the review of the literature, the ascertained grade level and the results of the questionnaire, revisions have been made for the manual, and a grade level has been determined for the revisions. Recommendations are also offered for improvement and a follow-on study on other aspects of the manual has been suggested.

NUMERICAL SIMULATION OF A SUPERSONIC INLET FLOW

by

Meng-Sing Liou

ABSTRACT

The progress of computational fluid dynamics has been advanced to a great extent for the past two decades. Various numerical methods have been devised and applied successfully to many complex flows involving both separation and unsteadiness. Both of these flows are likely to occur in the inlet of a high-speed air-breathing propulsion system. The present research effort is to develop the numerical capability to better predict the performance of an inlet and to better understand fluid dynamical mechanisms associated with the unsteadiness of the flow, which is closely related to the unstart of an inlet. In the present study a supersonic incoming uniform stream (M_∞ = 1.32) to a monotonically divergent inlet section is investigated. Depending upon the back pressure prescribed, several different flow features may occur. MacCormack's hybrid method is applied to solve the thin-layer form of the Navier-Stokes equations written in generalized curvilinear coordinates. The Wilcox-Rubesin two-equation model is employed to describe the turbulent eddy viscosity. Suitable characteristic boundary conditions are formulated. Unsteadiness of the flow is demonstrated in the computed results, and surface pressure distributions at various time instants are compared with the time-mean experimental data to illustrate the time-varying nature of the flow. The capability of the present computer code to capture accurately the important physics is demonstrated. Suggestions for further research are offered.

INFORMATION PROCESSING ANALYSES OF SPATIAL SYNTHESIS AND OF THE RELATIONSHIP BETWEEN LEARNING AND INTELLIGENCE

by

David F. Lohman

ABSTRACT

This report summarizes three experiments on the process of mentally synthesizing geometric shapes and two experiments on the relationship between learning and intelligence. The background, method, and preliminary results of each experiment are presented. Experiments on spatial synthesis showed substantial effects for mode of presentation (simultaneous or successive), feedback, and practice. Experiments on learning showed substantial effects in subjects' ability to recognize changes in context and changes in meaning. Implications for information processing theories of spatial ability and intelligence are discussed.

SUBOPTIMUM EXTRAPOLATION FOR SPECTRAL ESTIMATION

by

Lonnie C. Ludeman

ABSTRACT

Several analog systems for extrapolation of a section of analog data were investigated for possible use in spectral estimation. Systems considered had sectionlized and continuous logarithmic modulated and quadratic phase characteristics. The logarithmic phase system had extrapolation characteristics; however, it was very restricted in terms of bandwidth to effective center frequency ratio. Upon sectionalizing, a wider ratio could be obtained; however, the length of useful extrapolation became quite limited.

SILANE-TREATED SILICA FILLERS FOR ELASTOMER REINFORCEMENT

by

Larry M. Ludwick

ABSTRACT

Fumed silicas, Cab-O-Sil M5 and EH5, were surface treated with mixtures of hexamethyldisilazane (HMDS) and 1,3-divinyltetramethyldisilazane (DVMS). Variations were made in the amount of silazanes used, the ratio of the vinyl and methyl silazanes, in the method of dispersing the filler during treatment and in the surface area of the filler. All treated fillers were then compounded compounded with Silastic LS420. Following cure the formulations were subjected to standard tests to determine the effectiveness of the treatment. The high surface area filler EH5 treated with a 95 mol% HMDS/5 mol% DVMS solution involving a toluene reflux produced the greatest reinforcement effect in the elastomers. Using a colloid mill a large batch of the M5 filler was prepared for future use in the development of a new fluorosilicone hybrid elastomer known as FASIL.

THE APPLICATION OF STRUCTURAL EQUATION MODELING TO EXPERIMENTAL DATA

by

Robert MacCallum

ABSTRACT

The potential application of a quantitative procedure called structural equation modeling (SEM) to experimental data is investigated. Conditions under which such a use of SEM could be of value are specified. The use of coded variables to represent experimentally manipulated independent variables is described, and approaches to the incorporation of such variables into structural equation models are proposed. A method for adjusting data from repeated-measures designs, so as to make the data more suitable for analysis via SEM, is suggested. A brief illustration is presented. General recommendations are offered, along with suggestions for further research.

THE USE OF THE INSTANTANEOUS FREQUENCY TRANSIENT IN THE DESIGN AND OPTIMIZATION OF THE CHANNELIZED RECEIVER AND INSTANTANEOUS FREQUENCY MEASUREMENT (IFM) VERSIONS OF THE PASSIVE EW RECEIVER

by

William S. McCormick

ABSTRACT

Using analytic signal representation, the instantaneous frequency transient, $W_I(t)$, was analyzed for the filter/limiter chain of the High Probability Intercept Receiver (HPIR) in both the channelized receiver and IFM configurations. Using the concept of ensemble processing, the $W_I(t)$ transient was used with a conventional FM discriminator to define a new processing scheme that holds the promise of operating at very low pulse widths. The concept of ensemble processing was also applied to envelope processing within the channelized receiver configuration using the amplitude histogram, the matched filter, and the laquerre expansion respectively. The frequency transient was also used to analyze and calculate the estimation bias of the IFM receiver in both the traditional and in the channelized receiver hybrid configrations.

TECHNIQUES FOR ULTRA-SHORT PULSES IN Nd:YAG LASERS

by

Odis P. McDuff

ABSTRACT

The possibility of passively mode locking an actively Q-switched cw Nd:YAG laser by means of an antiresonant colliding pulse ring cavity was investigated. The gain of the medium power commercially available laser used in the study was found to be too low for mode locking to occur. Mode locking at low power was obtained when the antiresonant ring was replaced with a more conventional straight laser cavity. Harmonic doubling of the infrared energy to the visible was obtained.

An alternative scheme was suggested for the attainment of a very stable, but yet simple, mode locked laser output.

PLASMA GENERATION AND DIAGNOSTICS FOR IONOSPHERIC PLASMA SIMULATION

by

Bernard McIntyre

ABSTRACT

An electron/ion source was tested for possible use as a plasma source in ionospheric simulation where a plasma density of $10^3 - 10^5$ /cc is required. A system of Langmuir probes was used to monitor electron and ion concentrations in the Jumbo vacuum chamber of the Air Force Geophysics Laboratory and showed that far from the source the plasma density is only 10^3 /cc and that there are very likely significant electric fields in the chamber due to the large Debye length associated with this plasma. Small ratios of electron to ion current dentsities were observed and attributed to the presence of the electric fields.

SPECTROSCOPIC STUDIES OF THYRATRON DISCHARGES

by

Richard E. Miers

ABSTRACT

Electron processes in hot and cold cathode thyratrons were studied using spectroscopic analysis of the discharges. The spectra emitted from a helium filled cold-cathode tube was studied as the tube was operated in a continuous discharge mode. Graphical results of intensity versus position between electrodes are presented for various He I and He II spectral lines. The time evolution of various spectral lines was measured for a specially designed ITT thyratron filled with a mixture consisting of 0.6 torr of hydrogen gas plus 10% helium gas. Photographic results are presented. Recommendations for follow-on research are presented.

ON INTERFACING LOGIC PROGRAMMING SYSTEMS AND RELATIONAL DATABASES

By

John T. Minor

ABSTRACT

Current logic programming systems are inadequate for the implementation of knowledge-based systems which require a large number of facts and also want quick real-time responses to queries. To improve this situation, the possibility of using a relational database system as a secondary memory to hold and retrieve facts for the logic programming system was investigated. An interface between an actual logic programming system (LM-Prolog running on a LISP machine) and a database machine (IDM-500) was implemented, using the compiled-procedure approach. This approach was found to be the best for knowledge-based systems which have unchanging, moderately-sized intentional databases. A procedure for handling recursive rules in this approach was developed by the author and is described. Further problems which were discovered in the development of this interface, such as the handling of functional terms or side-effect operators, are presented and offered as suggestions for further research.

EVALUATION OF MODELS FOR LIQUID PROPELLANT ROCKET COMBUSTION INSTABILITY

by

Charles E. Mitchell

ABSTRACT

Models for the determination of the stability characteristics of liquid propellant rocket engine combustors are evaluated. Recommendations concerning the use of the four most widely used models; the Priem Model, the Crocco-Reardon Model, the Heidmann-Feiler Model, and the Dykema Model are made. Each of these models is found to be incomplete, inaccurate and/or approximate as far as predictive capability is concerned. The continuing need for fundamental understanding and modeling of the (open-loop) response of the combustion process is discussed, and research aimed at gaining this understanding is suggested. The need for an overall (closed-loop) combustion instability model which includes the major combustor features which may interact and affect stability is pointed out, and such a model, developed at Colorado State University, is presented and proposed for further development.

LARGE SPACE STRUCTURE DYNAMIC TESTING

by

Don Mittleman

ABSTRACT

The focus of this work is to describe theoretically the behavior of a flexible body subject to vibrations in a zero- gravity environment and to be able to simulate this behavior in a 1-g environment. Thus, if we have a flexible body suspended at n-points by fine wires that pass over frictionless pulleys and these wires then extend over a second set of pulleys and drop down to a second flexible body that is an identical copy of the first and is similarly attached to the wires, then the net forces, at least at the points of suspension, acting on either body, are zero. While we are far from solving the vibrational characteristics of such complex systems, these characteristics have been analyzed for two simple cases. These consist of a single and two masses rigidly connected. The theory and the apparatus for both cases are presented. The results of several numerical experiments as well as those of some physical experiments are described.

ACQUISITION OF WIND TUNNEL WALL PRESSURE DISTRIBUTIONS FOR USE IN DEVELOPING A 3-D TRANSONIC WALL CORRECTION CODE

by

Dale F. Moses

ABSTRACT

The case for low subsonic Mach numbers is discussed and results of wall pressure signatures at M=.3 are given. Runs were made at transonic Mach numbers of M=.6, .7, and .75 for odd angles of attack from $\alpha = 3^{\circ}$ to $\alpha = 19^{\circ}$. The results are discussed. The interference from the model support sting and angle of attack adjustment crescent was evaluated and the model wall pressures were corrected for this interference.

Transonic wall pressure signatures were obtained at a model position 14" forward of the test section window $\mathbb{C}$.

LEADERSHIP EFECTS AS MEASURED BY THE ORGANIZATIONAL ASSESSMENT PACKAGE: A MULTILEVEL PERSPECTIVE

Kevin W. Mossholder

ABSTRACT

The purpose of the present research was to conduct an exploratory analysis of leadership effects on selected factors measured by the Organizational Assessment Package (OAP). A multilevel perspective examining individual and group leadership effects on attitudinal factors served as the basis for the model used. In accordance with the contextual approach to multilevel analysis, hierarchical regression analysis was performed using as subjects workgroup members from selected functional areas. Results suggested that additional understanding of leadership effects may possibly be gained by utilizing a multilevel framework. Recommendations were made regarding the conceptualization of leadership as measured by the OAP and suggestions were offered concerning the consulting process as well as future research.

RAMAN SPECTROSCOPY OF UNSTIMULATED AND STIMULATED, CULTURED NORMAL AND NEOPLASTIC HUMAN OR MAMMALIAN CELLS

by

James J. Mrotek

ABSTRACT

Y-1 mouse adrenal tumor cells, and a human neoplastic, respiratory tract, fibroblast cell line, HEp-2, were examined using laser Raman spectroscopy. Methods were designed, and their efficacy tested, to produce cell suspensions for use in the Raman spectrometer. Because differentiated cellular function depends on large concentrations of certain unique intracellular molecules, attempts were made to determine whether characteristic Raman spectra would be produced by intracellular HEp-2 or Y-1 molecules irradiated with a laser beam tuned to one of several wavelengths. Using 514 and 488 nm data obtained from both cell lines was encouraging but inconclusive because of insufficient replication. Y-1 experiments using 476.5 nm involved runs repeated on the same sample, runs on different samples, and a run on a pool of three different cell generations. This wavelength produced what appeared to be several characteristic Y-1 emissions; some of these were analogous to emissions others previously obtained from carotenoids and heme-containing proteins. The Y-1 cells also seemed to respond to cAMP stimulation by producing emissions that differed from those of control cells. Detection of 476.5 nm-stimulated emissions appeared to improve if a parallel polarizer was inserted between sample and detector.

PRELIMINARY MONTE CARLO STUDIES OF THE STRUCTURE OF MOLTEN SALTS

by

R. D. Murphy

ABSTRACT

The Monte Carlo method of statistical mechanics has been applied to the study of the structure of a model of molten methylethylimidazolium chloride, which is one constituent of a class of room-temperature molten salts which are being studied as possible electrolytes for battery applications. The Monte Carlo studies tend to confirm the view of the structure of these ionic melts which has emerged from other data and cast some light upon clustering phenomena in molten salts. Suggestions for extension of the present work, both theoretically and experimentally, are offered.

MILITARY FAMILY STRESS

by

Lena Wright Myers

ABSTRACT

This research pursuit derived from an indepth review of related literature in an effort to discover and delineate the incidences of stress and the techniques employed to resolve stress within military families. It offers four broad questions to guide a projected exploratory study. The exploratory study should focus on the possible influence of family stress on occupational commitment or job involvement—by comparing stress among dual-career and non-dual-career families. A conceptual framework complemented by a theoretical orientation for future implementation of the exploratory research is provided.

AIR OXIDATION OF HYDRAZINE - A KINETIC STUDY

by

Datta V. Naik

ABSTRACT

The oxidation of hydrazine in air has been studied in a 350-liter chamber made of Teflon® film using long-path Fourier transform infrared spectroscopy (FTIR). Among the chamber characteristics, its leak rate is found to be negligible, and the complete purging is shown to require a volume of fresh, dry air six times the volume of the chamber.

In the chamber, the rate of hydrazine air oxidation is strongly dependent on air humidity. With dry, purified air the half-life of hydrazine in the chamber is reproducible and has an average value of 12.6 $\pm$ 0.6 hours. The reaction rate is found to increase with increase in Teflon® surface (increase in surface to volume ratio) in the chamber. The reaction rate is also strongly influenced by the type and area of other surfaces placed in the chamber. Among the surfaces studied, copper increases the reaction rate the most followed by painted surfaces, aluminum, and stainless steel (Type 302), in that order. Suggestions for further research in this area are offered.

CONCEPTUAL DESIGN OF THE USAF INSTALLATION RESTORATION PROGRAM INFORMATION MANAGEMENT SYSTEM

by

Stephan J. Nix

ABSTRACT

The conceptual design of a computerized information management system for the Air Force Installation Restoration Program (IRP) is outlined. The purpose of the IRP is to identify, quantify, and correct environmental problems associated with inactive hazardous waste disposal sites located on Air Force installations. There is a need to store the data collected in this program and provide the means through which information can be extracted from this data base. The conceptual design of the system evolves from an analysis of the demands on the system and the information needed to meet these demands. This analysis is followed by the development of the basic system structure. Implementation plans are also discussed.

THE CYTOTOXIC EFFECTS OF TRIMETHYLPENTANE ON RAT RENAL TISSUE

by

William N. Norton

ABSTRACT

The aliphatic hydrocarbon 2,3,4 trimethylpentane induced cytopathological renal lesions of the proximal convoluted tubule of the adult male rat. No discernable cellular alterations were noted among the hepatocytes examined. Three groups of 9 experimental organisms each received the hydrocarbon by gavage administration twice weekly at a concentration of 1.5 ml/kg body weight. The concentration proved to be non-lethal. At each of the respective periods of 1, 2 and 4 weeks subsequent to the initial exposure, 9 experimental and 5 control animals were sacrificed. The kidneys and liver were excised and processed for electron microscopy. The manifestations of toxicity were evident among all organisms analyzed with the severity and extent of cellular alterations a function of the duration of exposure. There were no noticable aberrations among the cellular components of the glomeruli examined from experimental organisms. The most prominent feature of altered cells among the proximal convoluted tubules was the presence of large membrane-bound granules. The structures were angular in contour with the interior charcterized by a periodicity of parallel repeating units. Focal sites of cellular degradation along the length of the proximal tubule appeared to result in the release of cytoplasmic organelles, nuclei and granules. In addition, whole cells were detached from the basal lamina and presumably passed into the tubular lumen.

Computer-Based Optimization Algorithms for LOGAIR Cargo Allocation

by

Dr. Kendall E. Nygard
Timothy R. Downes

Abstract

This report describes a mathematical formulation for modeling the LOGAIR system. It also discusses other contributions made during the summer research program.

The LOGAIR system is a privately contracted airlift system providing daily air cargo service to 56 bases in the continental United States (CONUS). The Air Force manages and controls the operation which uses 16 separate routes. Allocation of cargo to system capacity is presently handled manually by controllers stationed at WPAFB and various Air Logistics Centers located elsewhere.

Because of the limited efficiency of manually allocating cargo, and the great potential for human error, a way of mathematically modeling the allocation process and incorporating this model into a computer-based allocation system is investigated. The discussion centers on how certain aspects of the allocation process can be modeled as a multi-period generalized assignment problem, while other aspects could be modeled as a multicommodity capacitated transshipment problem.

Although the above formulations are difficult combinatorial optimization problems, recent studies suggest that the allocation models could be solved daily on a microcomputer. The mathematical models developed to date are presented and suggestions made for further research in development of the model and for implementing this model as the basis of a computer-based allocation system.

LASER DAMAGE STUDIES IN PURIFIED AND PLASTICIZED POLYAKYLMETHACRYLATES

by

Robert M. O'Connell

ABSTRACT

Experimental studies were made of the effects of monomer filtration and plasticization on the laser damage properties of polymethylmethacrylate and related transparent polymers. The results show that both processes can significantly improve single-shot damage thresholds. The multiple-shot damage measurements were insufficient to draw any similar conclusions. A simple technique that uses scattered, depolarized helium-neon laser light to estimate the concentration of micron-sized impurities in liquids or solids was developed and found to be a reliable predictor of single-shot damage resistance.

EXPERIMENTAL PHYSICS ASPECTS OF THE AFATL RAILGUN EFFORT

by

William B. Pardo

ABSTRACT

Techniques of data acquisition and analysis and their relationship to system performance evaluation and modelling are presented. The physics of the phenomena of muzzle flash and rail damage is discussed. Recommendations for future experimental research are given.

ANALYSIS OF THE VALIDITY OF BARNES TRANSMISSOMETER DATA

by

Prof. Martin A. Patt

ABSTRACT

Under NATO Project OPAQUE, large data files were collected for subsequent processing by the Air Force Geophysics Laboratory. The validity of some of the supplemental 1400-meter Barnes transmissometer data stored in processed hourly-files was suspect. The data has been carefully studied and a determination has been made that the 1400-meter Barnes data was not valid. The processing error which resulted in the the bad data was found, and the hourly data files were subsequently reprocessed.

PERMANENT PERIODIC MAGNETS AND THE REPRODUCIBILITY OF TRAVELING WAVE TUBES

by

James D. Patterson

ABSTRACT

The question of characterizing permanent periodic magnets (PPM), so that they will be relatively uniform and produce consistently satisfactory fields from traveling wave tube (TWT) to TWT is investigated. Two parts of this large problem were considered. First, the results of the investigation led to a short summary and list of references for magnet properties relevant to TWTs. Second, a calculation of field strengths from non-homogeneous ring magnets was made. The purpose of the calculation was to gain insight into the effect of inhomogeneities on measured field strengths at appropriate locations just outside the magnets. It is suggested that a quantitive study of how the pole pieces modulate the inhomogeneities would be very useful.

OPERATOR ACTIVITIES IN WIND TUNNEL 4T

by

M. Carr Payne, Jr.

ABSTRACT

By observation and a task analysis, a research team determined activities of Tunnel Operators, Instrument Technicians, Test/Operations Coordinators, and Project Engineers as they performed testing in Wind Tunnel 4T. Based on this data, recommendations are made which should improve operations in the Control Room of Tunnel 4T.

FUTURE TACTICAL AIR CONTROL SYSTEM DATABASE DESIGN

by

William Perrizo and Donald A. Varvel

ABSTRACT

Tactical command and control systems in the era of TACS-2000 and beyond will be distributed in order to maintain a sufficient degree of survivability. The underlying database system will also be distributed. It must respond quickly to both updates and requests for information, and must contain enough redundancy to sustain simultaneous losses of several elements. Few production distributed databases exist, and none appears suited to this application. This report details our work on designing a suitable database system. Our major work to date has been the areas of data replication, backup, and concurrency control. Suggestions for further research in this area are offered.

RAMAN SPECTROSCOPY OF GLYCOSAMINOGLYCANS FROM BOVINE CORNEA

by

Boake L. Plessy

ABSTRACT

Structural changes which may occur in the glycosaminoglycans of cornea with development, maturation, and senescence were investigated using laser Raman spectroscopy. Keratan sulfate and chondroitin sulfate were extracted from bovine cornea after proteolytic digestion and fractionated on a ECTEOLA cellulose column. After characterization of the isolated fractions, spectra were obtained on a modified commercial Raman spectrophotometer using the 514.5 nm, 488.0 nm, and 476.1 nm lines of an argon laser. Spectra were obtained with parallel and perpendicular polarization and on the Stoke's and anti-Stoke's lines. Suggestions are made for changes in sample handling and instrumentation to improve the quality of the spectra obtained.

STUDY OF CONTROL MIXER CONCEPT FOR RECONFIGURABLE FLIGHT CONTROL SYSTEM

by

Kuldip S. Rattan

ABSTRACT

Reconfiguration of flight control law after effector failure is studied in this effort. The objective of this research is to evaluate the control mixer concept which utilizes generalized inverse to distribute control authority among the remaining effectors after failure. The unmanned research vehicle (URV) was selected as a test bed for evaluating this concept. A mathematical model containing split surfaces and linearized equations of motion for coupled longitudinal and lateral-direction axes is developed. Control mixer gain matrices were obtained for failed surfaces. Comparison of the unimpaired and reconfigured aircraft were performed using the Continuous System Modeling Program (CSMP) Difficulties encountered with the generalized inverse based control mixer concept are discussed and recommendations for further research in the area are given.

ANALYSIS OF ARMOR BRACKETRY

by

HEMEN RAY

ABSTRACT

The concept of rotating armor is introduced. The rotation of the armor in its plane is effected by using specially designed either inclined bracketry or bracketry fabricated with composites. By allowing the armor to rotate in its plane, the impact energy is absorbed in the rotational direction in addition to the normal to the plane of the armor, thereby reducing the force transmitted to the bracketry. Aircraft stiffness has also significant influence on the force transmitted to the bracketry. Application of these type of bracketry could increase the ballistic limit, or decrease the weight of the armor system. Suggestions for further research on armor bracketry are offered.

ARTIFICIAL INTELLIGENCE AND COMPUTATIONAL LINGUISTICS RESEARCH

by

Larry H. Reeker

ABSTRACT

Work in Artificial Intelligence and Computational Linguistics was done at the Air Force Human Resources Laboratory, Training Systems Division, in three different areas. The first area was "expert systems", and the result was a demonstration system for use by personnel at the laboratory. Secondly, a study was undertaken of applications of computational linguistics in the work of the laboratory, resulting in a follow-up proposal. The third research area was an investigation of the possibility of providing tools for artificial intelligence in the Ada programming language, and resulted in some programs for that purpose. Suggestions are given for a follow-up project investigating the provision of an adaptive natural language interface for expert systems. Further research in Ada implementation of artificial intelligence tools is also suggested.

MATHEMATICAL MODELING OF THE HUMAN CARDIOPULMONARY SYSTEM

by

David B. Reynolds

ABSTRACT

The cardiopulmonary computer model developed by researchers at the University of Texas at Austin under contract with AFOSR is reviewed for its analytical soundness and appropriateness of application to problems of interest to the Air Force, especially the physiological effects of acceleration. From an analytical point of view, the biggest weakness of the model is in its treatment of flow in collapsible tubes. The accepted theory has been developed within the last ten years and has not been incorporated in the model. Another aspect needing attention is feedback control, at least in the circulation portion of the model. Although the original authors addressed this need, they had not incorporated feedback into the program by the end of the funding period. Other revisions of the analysis are addressed in the report. From a practical standpoint of use, the model should also be made more user-friendly and include computer graphics.

NONLINEAR MODELING OF

SEAT CUSHIONS

by

Joseph E. Saliba

ABSTRACT

A brief review of the history of seat cushions, modeling and analysis, in addition to a qualitative description of their influence on occupants during ejection or impact is first presented. Next, two nonlinear modeling approaches are described. The first is based on the mathematical theory of nonlinear viscoelasticity where the constitutive equations, relating stresses and strains, are written as a hereditary integral. This theory makes use of expressing the stress by a polynomial expansion in linear functionals of strain history. A minimum of two different levels of stress are needed in single-step creep tests to determine the mechanical properties of the nonlinear material. The second approach is based on the step-by-step integration method where the nonlinear behavior is approximated by a sequence of successively changing linear systems. The damping and stiffness properties are based on the current deformed state at the beginning of each time increment and hold constant during that increment. These mechanical properties are computed from the damping force versus velocity and the stiffness versus displacement curves. Finally, the seated man model, in series with the seat cushion model, is recommended for investigating qualitatively the influence of the seat cushions on spinal injuries during ejection.

THE RELATIONSHIP OF FIBRINOGEN AND PLASMA LIPIDS TO BUBBLE FORMATION AT THE AIR INTERFACE DURING DECOMPRESSION SICKNESS

by

Walter L. Salters, Ph.D.

ABSTRACT

Fibrinogen and plasma lipids have been implicated as being etiologically significant in decompression sickness (DCS) during blood-bubble formation at the air-surface interface. When fibrinogen is deposited on the bubble's surface, it becomes possible for the adhesion and aggregation of intravascular lipids and other blood components (i.e., platelets) at its surface. Determination of the concentration of these serological constituents in plasma and serum from experimental subjects before and after hypobaric flights in the altitude chamber will perhaps make it possible to assess their role in DCS. This study reveals that, through quantitative determination of plasma concentrations of cholesterol, high-density lipoprotein-associated cholesterol, triglycerides and fibrinogen, it may eventually become possible to determine subjects who are less prone to experience DCS during simulated compression/decompression exercises, and to better understand some of the hazardous effects of experimental aviation studies on flight personnel.

IN MEMORY OF

Dr. Lowell Schipper

who died during his appointment on the
1984 Summer Faculty Research Program

EVALUATION OF TRAINING PERFORMANCE FOR THE USAF CRITERION TASK SET (CTS)

by

Dr. Robert E. Schlegel

David W. Patterson

ABSTRACT

A study was conducted to determine the required number of training sessions for subjects to achieve asymptotic performance on the Criterion Task Set (CTS) information processing performance battery. The CTS is composed of nine tasks which measure independent information processing resources. One task measures perceptual input, six tasks measure central processing and two tasks measure motor output.

Twenty subjects were divided into four groups. One group trained on all nine tasks. The other three groups trained on different three-task subsets. All subjects trained for two hours per day on five consecutive days.

Performance measures for the majority of tasks included response time and accuracy. Subjective workload measures were also obtained. Preliminary analysis of the data indicates similar learning patterns for the nine-task and three-task groups with all groups demonstrating rapid improvement on most tasks. Recommendations for further data analysis and research extensions are also provided.

REGENERATIVE HEAT TRANSFER IN AN LSSCDS ENGINE

BY

Howard Schleier

ABSTRACT

TDK/BLM analyses of the Large Space System Cryogenic Deployment System (LSSCDS) were modified to correct the incoming enthalpy of the H_2 fuel. The geometry of the combustion chamber was included in the rocket coutour and some interations were made to reasonable convergence. Radiation upstream of the throat was estimated. The acceleration parameter was checked to see whether any relaminarization occurred. Velocity profiles were checked for the possibility of any BL separation.

It was determined on the basis of the above assumptions that the cooling load was approximately $414^{Btu}/_{s}$ as compared with Rocketdyne's estimate of $670^{Btu}/_{s}$. The $414^{Btu}/_{s}$ is $399 + 15^{Btu}/_{s}$ for radiation.

RAMAN SPECTROSCOPY STUDIES OF EXTRINSIC P-TYPE SILICON

by

James Schneider
and
Michael Wager

ABSTRACT

Raman spectroscopic studies of extrinsic p-type silicon samples were undertaken at temperatures of 300 K, 77 K, and near 4 K. These samples were conventionally doped with group IIIA elements. Using both incident light of a pulsed, frequency-doubled, Nd:YAG laser at 532nm and near IR laser pulses at 1064 nm, Raman scattering was investigated under several scattering geometries. With 532 nm light, the frequency shift of the LO phonon peak near 520 cm^{-1} in the Raman spectra of strained thin films of silicon on zirconia substrates was investigated by back scattering geometry. The weak Raman spectra from the doped impurities in bulk silicon samples was not observed with the visible incident radiation which is too strongly absorbed to penetrate the bulk of the sample. A study of the effect of a surface depletion layer on silicon samples of various thicknesses when used in Hall measurements to determine carrier concentration was conducted.

BACTERIOLOGIC TECHNIQUES FOR THE ISOLATION AND IDENTIFICATION OF LEGIONELLAE

by

Gordon D. Schrank

ABSTRACT

Efforts were directed at providing methods for the tentative identification of Legionellae submitted for characterization and determining if routine isolation of Legionellae from environmental samples is feasible without the use of laboratory animals or embryonated eggs. The three major groups of Legionellaceae can be differentiated using dye containing media; these groups include the genus Legionella and proposed genera Tatlockia and Fluoribacter. Other tests useful for tentative separation of species include brown pigment production on media containing aromatic substrates, growth in the presence of 1% NaCl, the results of a modified hippurate test, and the oxidase reaction. Further research is needed to insure that these organisms can be isolated from environmental samples. Current pretreatment and plating media were found to be inadequate for the routine recovery of Legionellae when present in low numbers. Suggestions for further research are included.

A THREE-DIMENSIONAL RADIATION BOUNDARY CONDITION FOR MESOSCALE NUMERICAL MODELS

by

Dr. Keith L. Seitter

ABSTRACT

The response of the lateral boundary conditions to waves generated during the geostrophic adjustment process is investigated in a three-dimensional meso-beta numerical model of the atmosphere. It is shown that the reflective nature of specified boundary conditions leads to significant errors even when strong damping is used to remove wave energy. The multi-dimensional radiation condition of Raymond and Kuo (1984) is implemented in the model and shown to allow outward propagation of the waves without reflection. The development of several routines to produce computer generated graphics of the model output are also outlined.

CALCULATION OF ENHANCED HEATING IN TURBULENT BOUNDARY LAYERS INFLUENCED BY FREE STREAM TURBULENCE

by

Paavo Sepri and Jon L. Ebert

ABSTRACT

A preliminary phenomenological computational model has been formulated and implemented for the purpose of predicting increased heating in boundary layer environments which are influenced by free stream turbulence. The model has been constructed primarily by scrutiny of recently published extensive flow measurements over heated flat plates, and it is also supported partially by analytical considerations. The mixing length model existing in the code STANCOOL has been modified to incorporate these free stream turbulence effects. The comparisons between measurements and calculations generally show improvement, but certain discrepancies are noted which require further investigation. An apparently novel observation is made concerning the structure of much of the outer region of a turbulent boundary layer in the presence of higher levels of free stream turbulence. Several variables follow a simple exponential character which may be of fundamental importance. This observation is used to lend credence to the computational model, but it also raises an apparent dilemma involving the energy equation. A central role in these calculations is played by the turbulent Prandtl number profile, the modeling of which determines quantitatively the heating of a surface. Comments are offered in connection with possible channel flow effects on measurements of Pr_t which indicate large decreases towards the free stream.

AN ADJOINT SYSTEMS APPROACH TO LEARNING AND TRANSFER OF TRAINING

by

Robert E. Shaw

ABSTRACT

The primary motivation of ground-based flight simulator training is the belief that this will provide a safe, relatively inexpensive, and effective way to train pilots. It is assumed, of course, that such training will transfer positively and significantly to the flying of real aircraft. However no conclusive experimental evidence currently exists to support this claim. One reason for the lack of such evidence is overdependence of the current research on the Optimal Control Model which is ill-suited for either motivating the appropriate experiments or predicting and explaining learning and transfer of training effects. Reasons for these conclusions are reviewed and recommendations for the development of adaptive models within the more promising field of adjoint systems theory are given. A mathematical overview of this new approach is provided that should be empirically tested. Recommendations are made for doing so.

The Theory of Self-Heating Phenomena in Explosives with Applications to EAK

by

John W. Sheldon

ABSTRACT

Pertubation theory is used to obtain the steady state temperature distribution in a subcritical spherical self-heating explosive. The theory is also used to obtain the time constant for supercritical self-heating to explosion. The effects of melting with self heating in the liquid state are analyzed in slab geometry, an approximate theory is developed and a numerical program described. Conditions are obtained for significant self-heating before melting is complete and it is shown that the melt front approaches a constant velocity as it proceeds through the solid.

THE DEVELOPMENT OF COMPUTATIONAL EFFICIENCIES IN CONTINUUM FINITE ELEMENT CODES USING MATRIX DIFFERENCE EQUATIONS

by

Harold C. Sorensen

ABSTRACT

The feasibility of using the Matrix Difference Equation (MDE) theory to obtain computational efficiencies in continuum finite element codes is investigated in this research. The study centered around the SAMSON2 code, which is a state-of-the-art 2-D code for dynamic structural analysis undergoing development within AFWL/NTE. The SAMSON2 code was studied in detail. From this study it was learned that solutions obtained with the use of the higher order elements are in error and that the slideline concept is not being used as it was originally intended. Correcting these algorithms in the code would make the code more efficient and accurate. A brief summary of the theory associated with the SAMSON2 code is presented.

A study of the MDE method was begun. The method has been shown to reduce the computational effort for a certain class of elastic structures. Extension to the non-linear case appears feasible. A brief summary of the MDE method is given. A section on recommendations for further research in these areas is also included.

BASE COMMUNICATIONS ARCHITECTURE SECURITY ISSUES

by

Charles J. Spiteri

ABSTRACT

The problem of applying DoD and 1974 Privacy Act mandated security to Air Force Base Local Area Networks is addressed. Both existing and future techniques and devices used to protect classified and privacy traffic on computer networks were researched. A plan for implementing security measures on base LANs is proposed in a three phase plan. The proposal utilizes today's technology for networks currently being installed. Data segregation by frequency, time or physical means, coupled with available encryption is recommended. Single and multilevel trusted interface units and gateways are proposed as they become available. End to end encryption is also proposed, either as a companion or alternative technique, depending on base and technology parameters. Suggestions are made to continue research in this vital area.

CARDIOVASCULAR RESPONSES OF HIGH- AND LOW-FIT MEN TO HEAD-DOWN REST FOLLOWED BY ORTHOSTASIS AND EXERCISE

by

William G. Squires

ABSTRACT

Head-down rest (HDR), a ground-based simulation of weightlessness, minimizes the hydrostatic intra- and extravascular pressure gradients that are normally present in the upright position causing a headward fluid shift. As a result, adaptive changes in other body systems occur producing signs of orthostatic intolerance upon reexposure to normal gravitational forces. These adaptive changes seem to differ between the levels of aerobic fitness. With this in mind, a preliminary study was conducted in which a similar protocol to this human study was followed except dog models were used. However, the dogs were instrumented acutely and thus were under the influences of anesthesia and positive pressure ventilation so this must be taken into account when considering the results. The results indicate that a difference does exist between trained and untrained dogs in response to head-down rest (HDR). In view of the different parameters measured and the data collected, the trained dogs responded with a lesser degree of variation. In other works, the trained dogs displayed a more stable system enabling them to better contend with any perturbation they might encounter. The trained dogs seemed to be able to compensate physiologically for the disturbances they confronted, thus minimizing the physiological stress and maximizing the homeostatic state. On the other hand, the untrained dogs lacked this physiological stability causing a pronounced response to the HDR. Consequently, the training effect seems to allow one to respond to change (HDR or weightlessness) with minimal physiological stress. However, this may be detrimental to orthostatc tolerance. It becomes important then to take into accoun the aerobic fitness of an individual when dealing with the weightless environment.

RECOMMENDATIONS ON COMBUSTION RESEARCH AT TYNDALL AIR FORCE BASE, FLORIDA

by

Dr. Arthur M. Sterling

ABSTRACT

With a view toward long-term research objectives, the current program on soot-abatement research being supported by the Environics Division of the Engineering and Services Center at Tyndall Air Force Base has been reviewed. It is argued that the environmental consequences of soot emission from aircraft engines for Air Force operations warrent an expanded research program, and recommendations on the objectives, the direction, and the scope of an expanded program are given.

ELECTROMAGNETIC LENS DESIGN TECHNIQUES

By

Alexander P. Stone

ABSTRACT

A lens design technique developed by Baum for transitioning TEM waves, ideally with no reflection or distortion, between cylindrical and conical transmission lines uses a differential geometric approach combined with Maxwell's equations and the constitutive parameters ϵ and μ in an orthogonal curvilinear coordinate system. Isotropic but inhomogeneous media are considered. An alternative approach, which has been used in the design of an anisotropic lens, uses differential impedance and transit-time matching. These two approaches are shown to be equivalent under certain assumptions. Recommendations are made for further research on these methods.

THE ROLE OF ANTIOXIDANT NUTRIENTS IN PREVENTING HYPERBARIC OXYGEN DAMAGE TO THE RETINA

by

William L. Stone

ABSTRACT

Hyperbaric oxygen was found to affect adversely the electrophysiological response of the retina to light in rats fed a diet deficinet in both vitamin E and selenium. Both vitamin E and selenium are micronutrients thought to play essential roles in preventing in vivo lipid peroxidation. Rats fed diets supplemented with vitamin E and/or selenium and treated with 2.0 ATA (atmospheres absolute) of 100 percent oxygen for 1.5 hours per day for 4 weeks did not show any decrease in electroretinogram response. The retina is known to be particularly susceptible to oxidative damage caused by in vivo lipid peroxidation. Dietary antioxidants appear to provide protection from hyperbaric oxygen damage to the rat retina.

NAPHTHALENE ADSORPTION BY FLORIDA SOILS

by

Jimmy J. Street

ABSTRACT

Fifteen Florida soils and a synthetic Al and Fe hydroxide and a natural humic acid were evaluated for naphthalene adsorption via a batch equilibrium experiment. Use of the Langmuir and Freundlich adsorption equations were only moderately successful in describing the adsorption process. Evaluation of several soil chemical properties and their relationship to the adsorption of naphthalene indicated that only soil organic carbon was important, while pH, mineralogy, "active" Al and Fe content were not important.

It appears from this study that adsorption of naphthalene, a non-ionic, non-polar organic constituent of Air Force jet fuels, can be adsorbed by soils and thus this process will play an important role in the environmental fate of thie compound in the soil/water system. The nature of the chemical interaction of naphthalene and soil organic matter was not elucidated, but base line data on the importance of soil organic matter was accumulated.

AN OPTIMAL TRAJECTORY PROBLEM

by

John J. Swetits

ABSTRACT

A least cost model for determining an optimal trajectory for attacking multiple targets on a single pass of the attacking aircraft is investigated. A Quasi-Newton procedure and a Levinberg-Marquardt procedure for solving an unconstrained model are compared. A penalty-multiplier method for solving a constrained model is investigated.

THE ROLE OF VORTEX SHEDDING IN A BLUFF-BODY COMBUSTOR

by

Richard S. Tankin

ABSTRACT

The results from visual observations and studies of high speed cine pictures of reacting flows with and without heat release in an axisymmetric, unducted, and vertically mounted bluff-body combustor are presented. For the reacting experiment without heat release, the fuel, a small concentration of $TiCl_4$ vapor added to dry air, is ejected from a jet located at the center of the bluff body. Turbulent mixing of the $TiCl_4$ and H_2O vapor contained in the annulus air, results in the formation of micron size particles of TiO_2 and with sheets of light directed both vertically and horizontally, provide a remarkably detailed visualization of the dynamic structures in the central jet and the recirculation zone behind the bluff body. The results from similar experiments with heat release are presented where $TiCl_4$ vapor is added to the gaseous propane and burned. Vortex shedding from the bluff-body is clearly evident in the experiments without heat release. However, vortex shedding did not occur in the combustion propane experiments because the recirculating flow became laminar as a result of the increase in kinematic viscosity due to the increase in temperature. Oscillations in the shear layer, observed in all the combusting experiments, grow in amplitude with increasing annulus air velocity. However, the flame lifted from the bluff body face before these oscillations reached sufficient amplitude to produce vortex shedding.

AN INVESTIGATION OF ACETYLCHOLINE AS A NEUROTRANSMITTER OF CEREBELLAR MOSSY FIBERS

by

William E. Thomas

ABSTRACT

The function of acetylcholine as a neurotransmitter of cerebellar mossy fibers was investigated using a subcellular fractionation procedure. The synthetic and degradative enzymes for acetylcholine were present in a purified fraction of mossy fiber terminals or glomeruli; however, no enrichment was found. Studies of choline uptake revealed the presence of a high-affinity transport system in the glomerular fraction. This choline uptake system exhibited a K_t of 1.1 μM and a V_{max} of 5.46 pmol/min/mg protein. Uptake was Na^+ dependent, inhibited by hemicholinium-3, and could be distinguished from homoexchange. On the basis of the presence of CAT, AChE, and especially high-affinity choline uptake in the purified glomerular preparation, it was concluded that some fraction of the mossy fibers is cholinergic.

Unified Real Part of Susceptibility over Millimeter through Infrared Region

by

Ken Tomiyama

ABSTRACT

The imaginary part of the complex susceptibility from millimeter to infrared and beyond has been studied extensively because of its association with the absorption spectra. However, the recent trend of computing the dispersion has developed the need for the real part of the susceptibility as well. This report partially answers this need by proposing an approximate unified real part expression with the line coupling term included for the use in both millimeter and infrared regions. The approach is to examine the two limiting forms in the millimeter and infrared regions, obtained through the Kramers-Kronig relationship, from the respective approximate imaginary parts in those regions. Then the two profiles were bridged by observing the transition from one range to the other. The accuracy of the proposed function was numerically checked using a newly obtained series expression for the exact real part, and was shown to be excellent in the vicinity of the line center where the real part is nontrivial.

NUMERICAL MODELING OF MULTIPHASE TURBULENT RECIRCULATING FLOWS IN SUDDEN-EXPANSION RAMJET GEOMETRY

by

Albert Y. Tong

ABSTRACT

The numerical modeling of multiphase flow in a sudden-expansion ramjet combustor geometry has been studied. The objective is to develop a computer code which can be used for the systematic study of the flow characteristics. The possibility of adapting and modifying existing computer codes available at the Aero Propulsion laboratory has been examined. It has been found that it would be most efficient to develop a custom-made droplet spray code and incorporate it into the existing STARRC code for the multiphase flow calculations. The details of the droplet spray formulation and the overall solution scheme are presented. Finally, certain research problems which are related to the present research are suggested for future study.

DEVELOPMENT OF THREE COVARIANCE STRUCTURE MODELS FOR ANALYSIS OF PERFORMANCE MEASUREMENT PROJECT DATA

by

Robert J. Vance

ABSTRACT

Three covariance structure models were developed to assess the construct validity of several job performance measures being developed for the Jet Engine Mechanic Specialty. The analyses are designed to clearly explicate the criterion space, that is, the criterion constructs and their interrelationships. Data will be collected during January-April, 1985, and analyses will be conducted shortly thereafter. Results of the analyses will contribute to an understanding of the job performance domain of the Jet Engine Mechanic Specialty. They will also provide information about the relative usefulness of the various measures employed, and about the validity of the ASVAB for predicting job success. It was recommended that future research focus on development of a method for assessing the costs and benefits associated with each of the performance measures, and with assessment of the utility (gain in productivity) of personnel management practices.

LAMINARIZATION IN HIGHLY ACCELERATED FLOW

by

Brian Vick

ABSTRACT

In the presence of severe streamwise accelerations, such as encountered in rocket nozzles and in flow over turbine blades, initially turbulent boundary layers can undergo a reverse transition towards a laminar state. This phenomenon of flow laminarization has not been adequately accounted for in the current schemes (TDK/BLM) used to predict rocket nozzle performance and thus forms the subject of this investigation. Despite the existance of important applications, basic information on laminarization is scarce with only a very few experimental results and some rather inconclusive theoretical studies available in the literature. In the present investigation the existing state of knowledge is examined and a plan of attack to bring the complex pheonomenon of flow laminarization onto a solid theoretical foundation is outlined.

DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTION

IN

BASIC ELECTRONIC TROUBLE SHOOTING

by

Stephen A. Wallace

ABSTRACT

The paper outlines a proposal for the development of a computer-assisted instruction system in electronic troubleshooting. In Phase 1 of the project, a computer-simulated troubleshooting system will be developed. The system will be designed to teach naive students the principles of logic function operation, a major component of modern electronic circuits. In Phase 2, an initial experiment will be performed which will investigate the effects of various feedback schedules on the initial training and the long term retention of troubleshooting logic function circuits. Suggestions for future research in the transfer of training area are outlined.

THE DEVELOPMENT OF A COMPUTERIZED SYSTEM FOR MANAGEMENT INFORMATION AND INTER-OFFICE COMMUNICATION

by

Yin-min Wei

ABSTRACT

This effort concentrates on the development of an overall system configuration and capability requirements for distributed multi-computer system for shared information storage and retrieval and data-communication between offices. This system needs computers which have enough large storage units to hold the files, abilities to understand human's requests in natural language, and abilities to quickly deliver requested information to the humans in easy-to-understand formats.

THE "PROCESSING WINDOW FOR THE NEAR BETA Ti-10V-2Fe-3Al ALLOY

by

Dr. Isaac Weiss

ABSTRACT

The control of grain size, grain shape and uniformity in order to avoid the formation of mixed grain size structure during processing from the ingot can be of great importance for further thermomechanical processing and for optimizing of final mechanical properties. It has been shown that this control can be achieved by processing through a certain temperature range termed the "processing window". The objective of the present work was to determine the "processing window" for the commercial Ti-10V-2Fe-3Al alloy. Test coupons taken from the ingot were forged to different total strain of 30% and 105% at temperatures ranging between 705°C (1300°F) and 1365°C (2500°F). Following deformation, the test pieces were annealed under vacuum at temperatures ranging from 815°C (1500°F) to 1337°C (2450°F) for 1 hour. Specimens were then oil quenched so that progress of static recrystallization could be followed. It was found that the appearance of the mixed grain size structure is associated with the recrystallization /grain growth behavior at high temperatures. The "processing window" for material forged to a 105% true strain was observed to extend to a higher processing temperature with minimum processing temperature of 1145°C (2100°F) and lower annealing temperature of 1050 C (1950 F) in comparison to the "processing window" for the material forged to a true strain of 30%.

EFFECTS OF HUMIDITY ON GASEOUS PHASE ADSORPTION OF TRICHLOROETHYLENE BY ACTIVATED CARBON

by

Martin D. Werner

ABSTRACT

Theoretical models applied to the adsorption of four concentrations of trichloroethylene (TCE) (300, 600, 1000, 1300 mg/m^3) from air at low relative humidity predicted the following: adsorptive capacity of activated carbon (maximum error compared to actual data < 17%), shape of the breakthrough curve (maximum error < 4%), and time to contaminant breakthrough (maximum error < 8%). These low humidity data were then compared to TCE adsorption by the same carbon at four other relative humidities (25%, 50%, 65%, 85%). The following observations were made. Increasing levels of humidity had increasingly deleterious effects on the adsorptive capacity of activated carbon at all TCE concentrations tested. The adverse effect caused by the presence of water vapor was more significant at the lower TCE concentrations than at higher concentrations. The presence of water vapor not only decreased the carbon's adsorptive capacity but also reduced its efficiency by increasing the dispersion of the breakthrough curve. Data at all humidity levels fit the Dubinin-Polanyi isotherm equation equally well, indicating the impact of water vapor on the adsorptive capacity of carbon for TCE is predictable and could be accurately modeled.

A COMPARATIVE ANALYSIS OF WHISPERED AND NORMALLY PHONATED SPEECH USING AN LPC-10 VOCODER

by

Johnny R. Wilson

ABSTRACT

The determination of the performance of the LPC-10 Vocoder in the processing of adult male and female whispered and normally phonated connected speech was the focus of this study. It was found that the LPC-10 Vocoder's analysis of whispered speech compared quite favorably with similar studies which used sound spectrographic processing techniques. It was also found that shifting from phonated speech quality to whispered speech quality caused a substantial increase in the phonemic formant frequencies and formant bandwidths for both male and female speakers.

The data from this study showed no evidence that the LPC-10 Vocoder's ability to process voices with pitch extremes and quality extremes was limited in any significant manner. A comparison of the unprocessed natural vowel waveforms and qualities with the synthesized vowel waveforms and qualities revealed almost imperceptible differences.

It was recommended that an investigation of the LPC-10 Vocoder's ability to process linguistic and dialectical suprasegmental features such as intonation, rate and stress at low bit rates should be a critical issue of concern for future research.

COGNITIVE FACTORS IN COMPUTER-AIDED FAULT DIAGNOSIS

by

Krystine Batcho Yaworsky

ABSTRACT

This report addresses issues concerned with the task of troubleshooting equipment failures in a context of increasingly more complex technology and sophisticated computer aids. Based upon a review of the literature on troubleshooting and human information processing, principles are suggested as guidelines for the design of computer aids for fault diagnosis. Such principles follow from an analysis of the needs of problem solvers for means of coping with short-term memory constraints, for the activation of a meaningful context in which information can be understood and retained, and for mechanisms for retrieving information and distinguishing between the relevant and the irrelevant. In order to translate principles of cognitive functioning into design characteristics, empirical investigation is needed to ensure valid generalizability from the traditional setting to the computer-aided environment. Recommendations as to the types of questions which need to be explored are provided along with examples of relevant research in the literature. The primary concern underlying all the recommendations is that the usefulness of specific design features should be evaluated empirically in experimental designs simulating essential aspects of the troubleshooting task before considerable investments in time, effort, and expense are committed to the development of sophisticated computer aids.

CHARACTERIZATION OF CERAMIC-CERAMIC COMPOSITES

by

Chyang John Yu

ABSTRACT

Nicalon SiC fiber reinforced magnesium aluminum silicate composites, which were fabricated from alkoxide derived hydroxide slurry and with different process parameters were analyzed with SEM, STEM, EDX and Electron Microprobe. It was found from these analyses that excessive residual carbon left in the matrix due to an incomplete binder burnout reacts with Al_2O_3 in the matrix. These reactions generate volatile species of AlO and/or Al_2O and leave the matrix with a porous structure at 1250°C. It was also found that the residual carbon in the matrix reacts with niobium ions to form NbC precipitates for all the samples. The presence of NbC crystals along the fiber/matrix interface as a result of reaction between SiC fiber and niobium ions in the matrix apparently improves the flexural strengths of the composites. A prolonged organics burnout cycle provided a pore free sample at 1250°C and its flexural strength of 95 ksi is the highest among all the samples prepared so far.

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